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(12) **United States Patent**
Blackburn et al.(10) **Patent No.:** **US 9,096,518 B2**(45) **Date of Patent:** **Aug. 4, 2015**(54) **SUBSTITUTED HYDROXAMIC ACIDS AND USES THEREOF**(75) Inventors: **Christopher Blackburn**, Natick, MA (US); **Jeffrey P. Ciavarri**, Reading, MA (US); **Kenneth M. Gigstad**, Westford, MA (US); **He Xu**, Natick, MA (US)(73) Assignee: **Millennium Pharmaceuticals, Inc.**, Cambridge, MA (US)

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(51) **Int. Cl.****C07D 217/16** (2006.01)**A61K 31/47** (2006.01)**C07D 209/44** (2006.01)**C07D 217/04** (2006.01)**C07D 217/06** (2006.01)**C07D 217/08** (2006.01)**C07D 223/16** (2006.01)**C07D 225/06** (2006.01)**C07D 401/04** (2006.01)**C07D 401/06** (2006.01)**C07D 401/10** (2006.01)**C07D 401/12** (2006.01)**C07D 403/04** (2006.01)**C07D 403/06** (2006.01)**C07D 405/06** (2006.01)**C07D 405/12** (2006.01)**C07D 409/06** (2006.01)**C07D 409/12** (2006.01)**C07D 413/06** (2006.01)**C07D 413/12** (2006.01)**C07D 413/14** (2006.01)**C07D 417/04** (2006.01)**C07D 417/06** (2006.01)**C07D 417/14** (2006.01)**C07D 491/04** (2006.01)(52) **U.S. Cl.**CPC **C07D 209/44** (2013.01); **C07D 217/04** (2013.01); **C07D 217/06** (2013.01); **C07D 217/08** (2013.01); **C07D 223/16** (2013.01); **C07D 225/06** (2013.01); **C07D 401/04** (2013.01); **C07D 401/06** (2013.01); **C07D 401/10** (2013.01); **C07D 401/12** (2013.01); **C07D 403/04** (2013.01); **C07D 403/06** (2013.01); **C07D 405/06** (2013.01); **C07D 405/12** (2013.01); **C07D 409/06** (2013.01); **C07D 409/12** (2013.01); **C07D 413/06** (2013.01); **C07D 413/12** (2013.01); **C07D 413/14** (2013.01); **C07D 417/04** (2013.01); **C07D 417/06** (2013.01); **C07D 417/14** (2013.01); **C07D 491/04** (2013.01)(58) **Field of Classification Search**

None

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,232,320	B1	5/2001	Stewart et al.
6,541,661	B1	4/2003	Delorme et al.
6,784,187	B2	8/2004	Wentland
7,250,514	B1	7/2007	Xiao
RE39,850	E	9/2007	Delorme et al.
2003/0187009	A1	10/2003	Wentland
2005/0148613	A1	7/2005	Van Emelen et al.
2006/0004041	A1	1/2006	Cummings et al.
2006/0058553	A1	3/2006	Leahy et al.
2007/0213392	A1	9/2007	Miller et al.
2011/0039827	A1	2/2011	Blackburn et al.
2011/0046157	A1	2/2011	Blackburn et al.

(Continued)

FOREIGN PATENT DOCUMENTS

EP	2100879	A1	9/2009
WO	WO 99/62908	A2	12/1999

(Continued)

OTHER PUBLICATIONS

International Search Report and Written Opinion of the International Searching Authority dated Aug. 23, 2010 issued in International Application No. PCT/US2010/01801, which corresponds to U.S. Appl. No. 12/803,169.

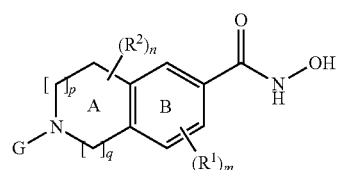
International Search Report and Written Opinion of the International Searching Authority dated Jan. 20, 2012 issued in International Application No. PCT/US2011/49136, which corresponds to U.S. Appl. No. 13/217,401.

Weinmann, Hilmar et al., "Histone Deacetylase Inhibitors: A Survey of Recent Patents," *Expert Opinion*, vol. 15, No. 12 (2005), pp. 1677-1690.

(Continued)

Primary Examiner — Zinna Northington Davis(74) *Attorney, Agent, or Firm* — Millennium Pharmaceuticals, Inc.(57) **ABSTRACT**

This invention provides compounds of formula (I) wherein R^1 , R^2 , G, m, n, p and q have values as described in the specification, useful as inhibitors of HDAC6. The invention also provides pharmaceutical compositions comprising the compounds of the invention and methods of using the compositions in the treatment of proliferative, inflammatory, infectious, neurological or cardiovascular diseases or disorders.



(I)

28 Claims, No Drawings

(56)

References Cited

U.S. PATENT DOCUMENTS

2012/0053201 A1 3/2012 Blackburn et al.
2012/0165316 A1 6/2012 Gould

FOREIGN PATENT DOCUMENTS

WO WO 00/75145 A1 12/2000
WO WO 02/36573 A2 5/2002
WO WO 2004/082638 A2 9/2004
WO WO 2005/040161 A1 5/2005
WO WO 2005/108367 A1 * 11/2005
WO WO 2007/115408 A1 10/2007
WO WO 2007/115410 A1 10/2007
WO WO 2008/076954 A2 6/2008
WO WO 2009/037001 A4 3/2009
WO WO 2009/112550 A1 9/2009
WO WO 2009/112550 A4 9/2009
WO WO 2009/129335 A2 10/2009
WO WO 2010/151317 A1 12/2010
WO WO 2010/151318 A1 12/2010
WO WO 2012/027564 A1 3/2012
WO WO 2012/088015 A2 6/2012

OTHER PUBLICATIONS

International Search Report and Written Opinion of the International Searching Authority dated Aug. 23, 2010 issued in International Application No. PCT/US2010/01800, which corresponds to U.S. Appl. No. 12/803,170.

International Search Report and Written Opinion of the International Searching Authority dated May 3, 2012 issued in International Application No. PCT/US2011/065985, which corresponds to U.S. Appl. No. 13/330,774.

Shinji, Chihiro, et al. "Design and synthesis of phthalimide-type histone deacetylase inhibitors," *Bioorganic & Medicinal Chemistry Letters*, vol. 15, No. 20 (2005) pp. 4427-4431.

Yang, Xiang-Jiao, et al., "The Rpd3/Hda1 family of lysine deacetylases: from bacteria and yeast to mice and men," *Nature Reviews*, vol. 9 (Mar. 2008) pp. 206-218.

Kawaguchi, Yoshiharu, et al., "The deacetylase HDAC6 regulates aggresome formation and cell viability in response to misfolded protein stress," *Cell*, vol. 115 (Dec. 12, 2003) pp. 727-738.

Simms-Waldrip, Tiffany, et al., "The aggresome pathway as a target for therapy in hematologic malignancies," *Molecular Genetics and Metabolism*, vol. 94 (2008) pp. 283-286.

Kapoor, Shailendra, Letter to the Editor, "Inhibition of HDAC6-dependent carcinogenesis: emerging, new therapeutic options besides belinostat," *International Journal of Cancer*, vol. 124 (2009) p. 509.

Iwata, Atsushi, et al., "HDAC6 and microtubules are required for autophagic degradation of aggregated huntingtin," *The Journal of Biological Chemistry*, vol. 280, No. 48 (Dec. 2, 2005) pp. 40282-40292.

Ding, Wen-Xing, et al., "Linking of autophagy to ubiquitin-proteasome system is important for the regulation of endoplasmic reticulum stress and cell viability," *The American Journal of Pathology*, vol. 171, No. 2 (Aug. 2007) pp. 513-524.

Park, Jung-Hyun, et al. "Class II histone deacetylases play pivotal roles in heat shock protein 90-mediated proteasomal degradation of vascular endothelial growth factor receptors," *Biochemical and Biophysical Research Communications*, vol. 368 (2008) pp. 318-322.

Carta, Sonia, et al., "Histone deacetylase inhibitors prevent exocytosis of interleukin-1 β -containing secretory lysosomes: role of microtubules," *Blood*, vol. 108, No. 5 (Sep. 1, 2006) pp. 1618-1626.

Mendrysa, Susan M., et al., "An integrated genetic-genomic approach for the identification of novel cancer loci in mice sensitized to c-Myc-induced apoptosis," *Genes & Cancer*, vol. 1, No. 5 (2010) pp. 465-479.

Namdar, Mandana, et al., "Selective inhibition of histone deacetylase 6 (HDAC6) induces DNA damage and sensitizes transformed cells to anticancer agents," *Proceedings of the National Academy of Sciences*, vol. 107, No. 46 (Nov. 16, 2010) (published on-line before print on Oct. 29, 2010 at: <http://www.pnas.org/cgi/doi/10.1073/pnas.1013754107>).

Tran, Andy Dong-Anh, et al., "HDAC6 deacetylation of tubulin modulates dynamics of cellular adhesions," *Journal of Cell Science*, vol. 120, No. 8 (2007) pp. 1469-1479.

Hubbert, Charlotte, et al., "HDAC6 is a microtubule-associated deacetylase," *Nature*, vol. 417, (May 23, 2002) pp. 455-458.

Kawada, Junichi, et al., "Tubacin kills Epstein-Barr virus (EBV)-Burkitt lymphoma cells by inducing reactive oxygen species and EBV lymphoblastoid cells by inducing apoptosis," *The Journal of Biological Chemistry*, vol. 284 (Jun. 19, 2009) pp. 17102-17109 (first published online on Apr. 22, 2009 at: <http://www.jbc.org/cgi/doi/10.1074/jbc.M809090200>).

Kaluza, David, et al., "Class IIb HDAC6 regulates endothelial cell migration and angiogenesis by deacetylation of cortactin," *The EMBO Journal* (2011) pp. 1-15.

d'Ydewalle, Constantin, et al., "HDAC6 inhibitors reverse axonal loss in a mouse model of mutant HSPB1-induced Charcot-Marie-Tooth disease," *Nature Medicine*, vol. 17, No. 8 (Aug. 2011) pp. 968-974.

Haggarty, Stephen J., et al., "Domain-selective small-molecule inhibitor of histone deacetylase 6 (HDAC6)-mediated tubulin deacetylation," *Proceedings of the National Academy of Sciences*, vol. 100, No. 8 (Apr. 15, 2003) pp. 4389-4394.

Itoh, Yukihiro, et al., "Design, synthesis, structure-selectivity relationship, and effect on human cancer cells of a novel series of histone deacetylase 6-selective inhibitors," *Journal of Medicinal Chemistry*, vol. 50 (2007) pp. 5425-5438.

Butler, Kyle V., et al., "Rational design and simple chemistry yield a superior, neuroprotective HDAC6 inhibitor, tubastatin A," *Journal of the American Chemical Society*, vol. 132 (2010) pp. 10842-10846.

Yao, Tso-Pang, "The role of ubiquitin in autophagy-dependent protein aggregate processing," *Genes & Cancer*, vol. 1, No. 7 (2010) pp. 779-786.

Li, Guoyi, et al., "HDAC6 α -tubulin deacetylase: a potential therapeutic target in neurodegenerative diseases," *Journal of the Neurological Sciences*, vol. 304 (2011) pp. 1-8.

Lee, Joo-Yong, et al., "Quality control autophagy A joint effort of ubiquitin, protein deacetylase and actin cytoskeleton," *Autophagy*, vol. 6, No. 4 (May 16, 2010) pp. 555-557.

Tapia, Monica, et al., "Impaired Function of HDAC6 slows down axonal growth and interferes with axon initial segment development," *PLoS ONE*, vol. 5, No. 9 (Sep. 2010) e12908, pp. 1-13.

Cabrero, J. Roman, et al., "Lymphocyte chemotaxis is regulated by histone deacetylase 6, independently of its deacetylase activity," *Molecular Biology of the Cell*, vol. 17 (Aug. 2006) pp. 3435-3445.

Bobrowska, Anna, et al., "Hdac6 knock-out increases tubulin acetylation but does not modify disease progression in the R6/2 mouse model of Huntington's disease," *PLoS ONE*, vol. 6, No. 6 (Jun. 2011) e20696, pp. 1-11.

Fiesel, Fabienne C., et al., "TDP-43 knockdown impairs neurite outgrowth dependent on its target histone deacetylase 6," *Molecular Neurodegeneration*, vol. 6, No. 64 (2011) pp. 1-10.

Lemon, Douglas D., et al., "Cardiac HDAC6 catalytic activity is induced in response to chronic hypertension," *Journal of Molecular and Cellular Cardiology* (2011) doi:10.1016/j.jmcc.2011.04.005.

Olzmann, J.A., et al., "Aggresome formation and neurodegenerative diseases: therapeutic implications," *Current Medicinal Chemistry*, vol. 15 (2008) pp. 47-60.

Zhu, Jianzhong, et al., "PKC α regulates Sendai virus-mediated interferon induction through HDAC6 and β -catenin," *The EMBO Journal*, vol. 30 (2011) pp. 4838-4849.

Zhang, Zhenhuan, et al., "HDAC6 expression is correlated with better survival in breast cancer," *Clinical Cancer Research*, vol. 10 (Oct. 5, 2004) pp. 6962-6968.

Fiesel, Fabienne C., et al., "Knockdown of transactive response DNA-binding protein (TDP-43) downregulates histone deacetylase 6," *The EMBO Journal*, vol. 29 (2010) pp. 209-221.

Beurel, Eleonore, "HDAC6 regulates LPS-tolerance in astrocytes," *PLoS ONE*, vol. 6, No. 10 (Oct. 2011) e25804, pp. 1-8.

(56)

References Cited

OTHER PUBLICATIONS

- Miki, Yasuo, et al., "Accumulation of histone deacetylase 6, an aggregate-related protein, is specific to Lewy bodies and glial cytoplasmic inclusions," *Neuropathology*, vol. 31, No. 6 (Dec. 2011) pp. 561-568 (first published online on Feb. 1, 2011: doi:10.1111/j.1440-1789.2011.01200.x).
- Kim, In Ah, et al., "Epigenetic modulation of radiation response in human cancer cells with activated EGFR or HER-2 signaling: potential role of histone deacetylase 6," *Radiotherapy and Oncology*, vol. 92 (2009) pp. 125-132.
- Mellado, Begona, et al., "Molecular biology of androgen-independent prostate cancer: the role of the androgen receptor pathway," *Clinical & Translational Oncology*, vol. 11 (2009) pp. 5-10.
- Bhalla, K.N., et al., "Inhibition of histone deacetylase (HDAC) 6 sensitizes human leukemia and breast cancer cells to antagonists of heat shock protein (hsp) 90 and/or bortezomib (BZ)," *Journal of Clinical Oncology*, Abstract, 2006 ASCO Annual Meeting Proceedings (Post-Meeting Edition), vol. 24, No. 18S (Jun. 20, 2006 Supplement) (2006) p. 13039.
- Dompierre, Jim P., "Histone deacetylase 6 inhibition compensates for the transport deficit in Huntington's disease by increasing tubulin acetylation," *The Journal of Neuroscience*, vol. 27, No. 13 (Mar. 28, 2007) pp. 3571-3583.
- Kazantsev, Aleksey G., et al., "Therapeutic application of histone deacetylase inhibitors for central nervous system disorders," *Nature Reviews*, vol. 7 (Oct. 2008) pp. 854-868.
- Dhakal, Bijaya K., et al., "Uropathogenic *Escherichia coli* invades host cells via an HDAC6-modulated microtubule-dependent pathway," *Journal of Biological Chemistry*, vol. 284, No. 1 (Jan. 2, 2009) pp. 446-454.
- Perez, Mar, et al., "Tau—an inhibitor of deacetylase HDAC6 function," *Journal of Neurochemistry*, vol. 109 (2009) pp. 1756-1766.
- Pugacheva, Elena N., et al., "HEF1-dependent aurora A activation induces disassembly of the primary cilium," *Cell*, vol. 129 (Jun. 29, 2007) pp. 1351-1363.
- Gao, Ya-sheng, et al., "The microtubule-associated histone deacetylase 6 (HDAC6) regulates epidermal growth factor receptor (EGFR) endocytic trafficking and degradation," *Journal of Biological Chemistry*, vol. 285, No. 15 (Apr. 9, 2010) pp. 11219-11226.
- Tannous, Paul, et al., "Intracellular protein aggregation is a proximal trigger of cardiomyocyte autophagy," *Circulation Journal of the American Heart Association*, vol. 117 (2008) pp. 3070-3078 (published online before print Jun. 9, 2008 at: doi:10.1161/CIRCULATIONAHA.107.763870).
- Rao, Rekha, et al., "HDAC6 inhibition enhances 17-AAG-mediated abrogation of hsp90 chaperone function in human leukemia cells," *Blood*, vol. 112, No. 5 (Sep. 1, 2008) pp. 1886-1893.
- Zhou, Jun, et al., "The protein farnesyltransferase regulates HDAC6 activity in a microtubule-dependent manner," *Journal of Biological Chemistry*, vol. 284, No. 15 (Apr. 10, 2009) pp. 9648-9655.
- Cha, Tai-Lung, et al., "Dual degradation of aurora A and B kinases by the histone deacetylase inhibitor LBH589 induces G2-M arrest and apoptosis of renal cancer cells," *Clinical Cancer Research*, vol. 15, No. 3 (Feb. 1, 2009) pp. 840-850.
- Kozikowski, Alan P., "Functional differences in epigenetic modulators—superiority of mercaptoacetamide-based histone deacetylase inhibitors relative to hydroxamates in cortical neuron neuroprotection studies," *Journal of Medicinal Chemistry*, vol. 50 (2007) pp. 3054-3061.
- Boyault, C., et al., "HDAC6, at the crossroads between cytoskeleton and cell signaling by acetylation and ubiquitination," *Oncogene*, vol. 26 (2007) pp. 5468-5476.
- Saunders, L.R., et al., "Sirtuins: critical regulators at the crossroads between cancer and aging," *Oncogene*, vol. 26 (2007) pp. 5489-5504.
- Li, Yu, et al., "HDAC6 is required for epidermal growth factor-induced β -catenin nuclear localization," *Journal of Biological Chemistry*, vol. 283, No. 19 (May 9, 2008) pp. 12686-12690.
- Fiskus, Warren, et al., "Molecular and biologic characterization and drug sensitivity of pan-histone deacetylase inhibitor-resistant acute myeloid leukemia cells," *Blood*, vol. 112, No. 7 (Oct. 1, 2008) pp. 2896-2905.
- Nawrocki, Steffan T., et al., "Aggresome disruption: a novel strategy to enhance bortezomib-induced apoptosis in pancreatic cancer cells," *Cancer Research*, vol. 66, No. 7 (Apr. 1, 2006) pp. 3773-3781.
- Boyault, Cyril, et al., "HDAC6-p97/VCP controlled polyubiquitin chain turnover," *The EMBO Journal*, vol. 25 (2006) pp. 3357-3366.
- Hideshima, Teru, et al., "Small-molecule inhibition of proteasome and aggresome function induces synergistic antitumor activity in multiple myeloma," *Proceedings of the National Academy of Sciences*, vol. 102, No. 24 (Jun. 14, 2005) pp. 8567-8572.
- Rivieccio, Mark A., et al., "HDAC6 is a target for protection and regeneration following injury in the nervous system," *Proceedings of the National Academy of Sciences*, vol. 106, No. 46 (Nov. 17, 2009) pp. 19599-19604.
- Parmigiani, R.B., et al., "HDAC6 is a specific deacetylase of peroxiredoxins and is involved in redox regulation," *Proceedings of the National Academy of Sciences*, vol. 105, No. 28 (Jul. 15, 2008) pp. 9633-9638.
- Matthias, Patrick, et al., "HDAC6 a new cellular stress surveillance factor," *Cell Cycle*, vol. 7, No. 1 (Jan. 1, 2008) pp. 7-10.
- Rodriguez-Gonzalez, Agustin, et al., "Role of the aggresome pathway in cancer: targeting histone deacetylase 6-dependent protein degradation," *Cancer Research*, vol. 68, No. 8 (Apr. 15, 2008) pp. 2557-2559.
- Lee, Yi-Shan, et al., "The cytoplasmic deacetylase HDAC6 is required for efficient oncogenic tumorigenesis," *Cancer Research*, vol. 68, No. 18 (Sep. 15, 2008) pp. 7561-7569.
- Lee, Joo-Yong, et al., "HDAC6 controls autophagosome maturation essential for ubiquitin-selective quality-control autophagy," *The EMBO Journal*, vol. 29 (2010) pp. 969-980.
- Memura, Kazuo, et al., "Effects of downregulated HDAC6 expression on the proliferation of lung cancer cells," *Biochemical and Biophysical Research Communications*, vol. 374 (2008) pp. 84-89.
- Crabbe, Tom, et al., "The PI3K inhibitor arsenal: choose your weapon!" *TRENDS in Biochemical Sciences*, vol. 32, No. 10 (2007) pp. 45-456.
- Pandey, Udai Bhan, et al., "HDAC6 rescues neurodegeneration and provides an essential link between autophagy and the UPS," *Nature*, vol. 447 (Jun. 14, 2007) pp. 859-863.
- Zhang, Xiaochong, et al., "HDAC6 modulates cell motility by altering the acetylation level of cortactin," *Molecular Cell*, vol. 27 (Jul. 20, 2007) pp. 197-213.
- Deribe, Yonathan Lissanu, et al., "Regulation of epidermal growth factor receptor trafficking by lysine deacetylase HDAC6," *Science Signaling*, vol. 2, No. 102 (Dec. 22, 2009) ra84 pp. 1-12 (published online at: DOI: 10.1126/scisignal.2000576).
- Park, Jung-Hyun, et al., "Inhibitors of histone deacetylases induce tumor-selective cytotoxicity through modulating Aurora-A kinase," *Journal of Molecular Medicine*, vol. 86 (2008) pp. 117-128.
- Bazzaro, Martina, et al., "Ubiquitin proteasome system stress underlies synergistic killing of ovarian cancer cells by bortezomib and novel HDAC6 inhibitor," *Clinical Cancer Research*, vol. 14, No. 22 (Nov. 15, 2008) pp. 7340-7347.
- Shan, Bin, et al., "Requirement of HDAC6 for transforming growth factor- β 1-induced epithelial-mesenchymal transition," *Journal of Biological Chemistry*, vol. 283, No. 30 (Jul. 25, 2008) pp. 21065-21073.
- Kalveram, Bide, et al., "The ubiquitin-like modifier FAT10 interacts with HDAC6 and localizes to aggresomes under proteasome inhibition," *Journal of Cell Science*, vol. 121, No. 24 (2008) pp. 4079-4088.
- Valenzuela-Fernandez, Agustin, et al., "HDAC6: a key regulator of cytoskeleton, cell migration and cell-cell interactions," *Trends in Cell Biology*, vol. 18, No. 6 (2008) pp. 291-297.
- Du, Guiping, et al., "To prevent neurodegeneration HDAC6 uses different strategies for different challenges," *Communicative & Integrative Biology*, vol. 4, No. 2 (Mar./Apr. 2011) pp. 139-142.
- Paris, Marielle, et al., "Histone deacetylase inhibitors: from bench to clinic," *Journal of Medicinal Chemistry*, vol. 51, No. 6 (Mar. 27, 2008) pp. 1505-1529.

(56)

References Cited

OTHER PUBLICATIONS

Santo L. et al., "Selective Inhibition of HDAC6 with a New Prototype Inhibitor (ACY-1215) Overcomes Bortezomib Resistance in Multiple Myeloma (MM)," *Blood*, (ASH Annual Meeting Abstracts) (2010) 116: Abstract 2997.

Office Action dated Jul. 9, 2012 in pending U.S. Appl. No. 13/217,401.

Office Action dated Jan. 14, 2013 in pending U.S. Appl. No. 12/803,170.

Hubbs, Jed L. et al., "Amino Acid Derivatives as Histone Deacetylase Inhibitors," *Bioorganic & Medicinal Chemistry Letters*, vol. 18 (2008), pp. 34-38.

George, Dawn et al., "Discovery of Thieno[2,3-c]pyridines as Potent COT Inhibitors," *Bioorganic & Medicinal Chemistry Letters*, vol. 18 (2008), pp. 4952-4955.

Cenik, Basar et al., "Suberoylanilide Hydromamic Acid (Vorinostat) Up-Regulates Progranulin Transcription," *The Journal of Biological Chemistry*, vol. 286, No. 18 (May 6, 2011), pp. 16101-16108.

Office Action dated Jul. 24, 2014 in pending JP patent application Serial No. 2012-516072.

Office Action dated Nov. 8, 2013 in pending EP patent application Serial No. 10792446.6.

Office Action dated Aug. 26, 2013 in pending U.S. Appl. No. 13/330,774.

* cited by examiner

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SUBSTITUTED HYDROXAMIC ACIDS AND USES THEREOF

PRIORITY CLAIM

This application claims the benefit under 35 U.S.C. §119 (e) of U.S. Provisional Patent Application Ser. No. 61/219,096, filed Jun. 22, 2009, incorporated by reference in its entirety.

FIELD OF THE INVENTION

The invention relates to compounds and methods for the selective inhibition of HDAC6. The present invention relates to compounds useful as HDAC6 inhibitors. The invention also provides pharmaceutical compositions comprising the compounds of the invention and methods of using the compositions in the treatment of various diseases.

BACKGROUND OF THE INVENTION

Histone deacetylase 6 (HDAC6) is a member of a family of amidohydrolases commonly referred to as histone or lysine deacetylases (HDACs or KDACs) as they catalyze the removal of acetyl groups from the ϵ -amino group of lysine residues from proteins. The family includes 18 enzymes which can be divided in 3 main classes based on their sequence homology to yeast enzymes Rpd3 (Class I), Hda1 (Class II) and Sir2 (Class III). A fourth class was defined with the finding of a distinct mammalian enzyme—HDAC11 (reviewed in Yang, et al., *Nature Rev. Mol. Cell Biol.* 2008, 9:206-218 and in Saunders and Verdin, *Oncogene* 2007, 26(37):5489-5504). Biochemically, Class I (HDAC1, 2, 3, 8) and Class II (HDAC4, 5, 6, 7, 9, 10) and Class IV (HDAC11) are Zn^{2+} -dependent enzymes, while Class III (SIRT1-7) are dependent on nicotinamide adenine dinucleotide (NAD^+) for activity. Unlike all other HDACs, HDAC6 resides primarily in the cytosol, it has 2 functional catalytic domains and a carboxy-terminal Zn^{2+} -finger ubiquitin binding domain that binds ubiquitinated misfolded proteins (Kawaguchi et al., *Cell* 2003, 115(6):727-738), ubiquitin (Boyault et al., *EMBO J.* 2006, 25(14): 3357-3366), as well as ubiquitin-like FAT10 modifier (Kalveram et al., *J. Cell Sci.* 2008, 121(24):4079-4088). Known substrates of HDAC6 include cytoskeletal proteins α -tubulin and cortactin; β -catenin which forms part of adherens junctions and anchors the actin cytoskeleton; the chaperone Hsp90; and the redox regulatory proteins peroxiredoxin (Prx) I and Prx II (reviewed in Boyault et al., *Oncogene* 2007, 26(37):5468-5476; Matthias et al., *Cell Cycle* 2008, 7(1):7-10; Li et al., *J Biol. Chem.* 2008, 283(19):12686-12690; Parmigiani et al., *Proc. Natl. Acad. Sci. USA* 2009, 105(28):9633-9638). Thus, HDAC6 mediates a wide range of cellular functions including microtubule-dependent trafficking and signaling, membrane remodeling and chemotactic motility, involvement in control of cellular adhesion, ubiquitin level sensing, regulation of chaperone levels and activity, and responses to oxidative stress. All of these functions may be important in tumorigenesis, tumor growth and survival as well as metastasis (Simms-Waldrup et al., *Mol. Genet. Metabolism* 2008, 94(3):283-286; Rodriguez-Gonzalez et al., *Cancer Res.* 2008, 68(8):2557-2560; Kapoor, *Int. J. Cancer* 2009, 124:509; Lee et al., *Cancer Res.* 2008, 68(18):7561-7569). Recent studies have shown HDAC6 to be important in autophagy, an alternative pathway for protein degradation that compensates for deficiencies in the activity of the ubiquitin proteasome system or expression of proteins prone to form aggregates and can be activated following treatment

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with a proteasome inhibitor (Kawaguchi et al., *Cell* 2003, 115(6):727-738; Iwata et al., *J. Biol. Chem.* 2005, 280(48): 40282-40292; Ding et al., *Am. J. Pathol.* 2007, 171:513-524, Pandey et al., *Nature* 2007, 447(7146):860-864). Although the molecular mechanistic details are not completely understood, HDAC6 binds ubiquitinated or ubiquitin-like conjugated misfolded proteins which would otherwise induce proteotoxic stress and then serves as an adaptor protein to traffic the ubiquitinated cargo to the microtubule organizing center using the microtubule network via its known association with dynein motor protein. The resulting perinuclear aggregates, known as aggresomes, are then degraded by fusion with lysosomes in an HDAC6- and cortactin-dependent process which induces remodeling of the actin cytoskeleton proximal to aggresomes (Lee et al., *EMBO J.* 2010, 29:969-980). In addition, HDAC6 regulates a variety of biological processes dependent on its association with the microtubular network including cellular adhesion (Tran et al., *J. Cell Sci.* 2007, 120(8):1469-1479) and migration (Zhang et al., *Mol. Cell* 2007, 27(2):197-213; reviewed in Valenzuela-Fernandez et al., *Trends Cell. Biol.* 2008, 18(6):291-297), epithelial to mesenchymal transition (Shan et al., *J. Biol. Chem.* 2008, 283(30):21065-21073), resistance to anoikis (Lee et al., *Cancer Res.* 2008, 68(18):7561-7569), epithelial growth factor-mediated Wnt signaling via β -catenin deacetylation (Li et al., *J. Biol. Chem.* 2008, 283(19):12686-12690) and epithelial growth factor receptor stabilization by endocytic trafficking (Lissanu Deribe et al., *Sci. Signal.* 2009, 2(102):ra84; Gao et al., *J. Biol. Chem.* 2010, 285:11219-11226); all events that promote oncogenesis and metastasis (Lee et al., *Cancer Res.* 2008, 68(18):7561-7569). HDAC6 activity is known to be upregulated by Aurora A kinase in cilia formation (Pugacheva et al., *Cell* 2007, 129(7):1351-1363) and indirectly by farnesyl transferase with which HDAC6 forms a complex with microtubules (Zhou et al., *J. Biol. Chem.* 2009, 284(15): 9648-9655). Also, HDAC6 is negatively regulated by tau protein (Perez et al., *J. Neurochem.* 2009, 109(6):1756-1766).

Diseases in which selective HDAC6 inhibition could have a potential benefit include cancer (reviewed in Simms-Waldrup et al., *Mol. Genet. Metabolism* 2008, 94(3):283-286 and Rodriguez-Gonzalez et al., *Cancer Res.* 2008, 68(8):2557-2560), specifically: multiple myeloma (Hideshima et al., *Proc. Natl. Acad. Sci. USA* 2005, 102(24):8567-8572); lung cancer (Kamemura et al., *Biochem. Biophys. Res. Commun.* 2008, 374(1):84-89); ovarian cancer (Bazzaro et al., *Clin. Cancer Res.* 2008, 14(22):7340-7347); breast cancer (Lee et al., *Cancer Res.* 2008, 68(18):7561-7569); prostate cancer (Mellado et al., *Clin. Trans. Onco.* 2009, 11(1):5-10); pancreatic cancer (Nawrocki et al., *Cancer Res.* 2006, 66(7): 3773-3781); renal cancer (Cha et al., *Clin. Cancer Res.* 2009, 15(3):840-850); and leukemias such as acute myeloid leukemia (AML) (Fiskus et al., *Blood* 2008, 112(7):2896-2905) and acute lymphoblastic leukemia (ALL) (Rodriguez-Gonzalez et al., *Blood* 2008, 112(11): Abstract 1923).

Inhibition of HDAC6 may also have a role in cardiovascular disease, i.e. cardiovascular stress, including pressure overload, chronic ischemia, and infarction-reperfusion injury (Tannous et al., *Circulation* 2008, 117(24):3070-3078); bacterial infection, including those caused by uropathogenic *Escherichia coli* (Dhakal and Mulve, *J. Biol. Chem.* 2008, 284(1):446-454); neurological diseases caused by accumulation of intracellular protein aggregates such as Huntington's disease (reviewed in Kazantsev et al., *Nat. Rev. Drug Disc.* 2008, 7(10):854-868; see also Dompierre et al., *J. Neurosci.* 2007, 27(13):3571-3583; Kozikowski et al., *J. Med. Chem.* 2007, 50:3054-3061) or central nervous system trauma caused by tissue injury, oxidative-stress induced neuronal or

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axonal degeneration (Rivieccio et al., *Proc. Natl. Acad. Sci. USA* 2009, 106(46):19599-195604); and inflammation, including reduction of pro-inflammatory cytokine IL-1 β (Carta et al., *Blood* 2006, 108(5):1618-1626), increased expression of the FOXP3 transcription factor, which induces immunosuppressive function of regulatory T-cells resulting in benefits in chronic diseases such as rheumatoid arthritis, psoriasis, multiple sclerosis, lupus and organ transplant rejection (reviewed in Wang et al., *Nat. Rev. Drug Disc.* 2009 8(12):969-981).

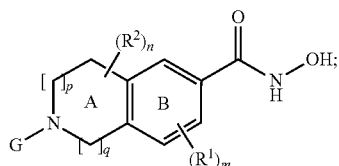
Given the complex function of HDAC6, selective inhibitors could have potential utility when used alone or in combination with other chemotherapeutics such as microtubule destabilizing agents (Zhou et al., *J. Biol. Chem.* 2009, 284 (15): 9648-9655); Hsp90 inhibitors (Rao et al., *Blood* 2008, 112(5)1886-1893); inhibitors of Hsp90 client proteins, including receptor tyrosine kinases such as Her-2 or VEGFR (Bhalla et al., *J. Clin. Oncol.* 2006, 24(18S): Abstract 1923; Park et al., *Biochem. Biophys. Res. Commun.* 2008, 368(2): 318-322), and signaling kinases such as Bcr-Abl, Akt, mutant FLT-3, c-Raf, and MEK (Bhalla et al., *J. Clin. Oncol.* 2006, 24(18S): Abstract 1923; Kamemura et al., *Biochem. Biophys. Res. Commun.* 2008, 374(1):84-89); inhibitors of cell cycle kinases Aurora A and Aurora B (Pugacheva et al., *Cell* 2007, 129(7):1351-1363; Park et al., *J. Mol. Med.* 2008, 86(1):117-128; Cha et al., *Clin. Cancer Res.* 2009, 15(3):840-850); EGFR inhibitors (Lissanu Deribe et al., *Sci. Signal.* 2009, 2(102): ra84; Gao et al., *J. Biol. Chem.* E-pub Feb. 4, 2010) and proteasome inhibitors (Hideshima et al., *Proc. Natl. Acad. Sci. USA* 2005, 102(24):8567-8572) or other inhibitors of the ubiquitin proteasome system such as ubiquitin and ubiquitin-like activating (E1), conjugation (E2), ligase enzymes (E3, E4) and deubiquitinase enzymes (DUBs) as well as modulators of autophagy and protein homeostasis pathways. In addition, HDAC6 inhibitors could be combined with radiation therapy (Kim et al., *Radiother. Oncol.* 2009, 92(1):125-132).

Clearly, it would be beneficial to provide novel HDAC6 inhibitors that possess good therapeutic properties, especially for the treatment of proliferative diseases or disorders.

DETAILED DESCRIPTION OF THE INVENTION

1. General Description of Compounds of the Invention

The present invention provides compounds that are inhibitors of HDAC6, and are useful for the treatment of proliferative diseases or disorders. In one aspect of the present invention, the compounds of the invention are represented by formula (I):



or a pharmaceutically acceptable salt thereof; wherein:
p is 0-2;
q is 1-4;
provided that:
i) the total of p and q is 1-4;
ii) when p is 0, q is not 2;

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G is $-R^3$, $-V_1-R^3$, $-V_1-L_1-R^3$, $-L_1-V_2-R^3$, $-L_1-R^3$, or $-L_1-V_2-L_2-R^3$;

L_1 and L_2 are each independently unsubstituted or substituted C_{1-3} alkylene chain, where one carbon atom may be replaced with $-CR^4=CR^4-$;

V_1 is $-C(O)-$, $-C(S)-$, $-C(O)-N(R^{4a})-$, $-C(O)-O-$, or $-S(O)_2-$;

V_2 is $-C(O)-$, $-C(S)-$, $-N(R^{4a})-$, $-C(O)-N(R^{4a})-$, $-N(R^{4a})-C(O)-$, $-SO_2-N(R^{4a})-$, $-N(R^{4a})-SO_2-$, $-C(O)-O-$, $-O-C(O)-$, $-O-$, $-S(O)_2-$, $-N(R^{4a})-C(O)-N(R^{4a})-$, $-N(R^{4a})-C(O)-O-$, $-O-C(O)-N(R^{4a})$, or $-N(R^{4a})-SO_2-N(R^{4a})-$;

R^3 is unsubstituted or substituted C_{1-6} aliphatic, unsubstituted or substituted 3-10-membered cycloaliphatic, unsubstituted or substituted 4-10-membered heterocyclyl having 1-4 heteroatoms independently selected from nitrogen, oxygen, and sulfur, unsubstituted or substituted 6-10-membered aryl, or unsubstituted or substituted 5-10-membered heteroaryl having 1-4 heteroatoms independently selected from nitrogen, oxygen, and sulfur;

each occurrence of R^4 is independently hydrogen, halo, or an optionally substituted C_{1-4} aliphatic group;

each occurrence of R^{4a} is independently hydrogen, or an optionally substituted C_{1-4} aliphatic group;

ring B is optionally further substituted with m occurrences of R^1 ;

each occurrence of R^1 is independently halo, C_{1-3} alkyl, C_{1-3} haloalkyl, $-O-C_{1-3}$ alkyl, $-O-C_{1-3}$ haloalkyl, $-CN$, $-NHC(O)C_{1-3}$ alkyl, $-NHC(O)NHC_{1-3}$ alkyl, or $NHS(O)_2C_{1-3}$ alkyl;

ring A is optionally further substituted with n occurrences of R^2 ;

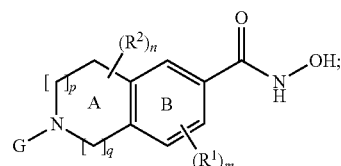
each occurrence of R^2 is independently halo, C_{1-3} alkyl, C_{1-3} haloalkyl, $-O-C_{1-3}$ alkyl, $-O-C_{1-3}$ haloalkyl, $-NHC(O)C_{1-3}$ alkyl, $-NHC(O)NHC_{1-3}$ alkyl, or $NHS(O)_2C_{1-3}$ alkyl;

m is 0-2; and

n is 0-4.

In some embodiments, p is 0 and q is 3 or 4; or p is 1 and q is 2 or 3; or p is 2 and q is 1 or 2.

In another aspect of the present invention, the compounds of the invention are represented by formula (I):



or a pharmaceutically acceptable salt thereof;
wherein:

p is 0 and q is 3 or 4; or p is 1 and q is 2 or 3; or p is 2 and q is 1 or 2;

G is $-R^3$, $-V_1-R^3$, $-V_1-L_1-R^3$, $-L_1-V_1-R^3$, $-L_2-V_2-R^3$, $-V_1-L_1-V_2-R^3$, or $-L_1-R^3$;

L_1 is unsubstituted or substituted C_{1-3} alkylene chain, where one carbon atom may be replaced with $-CR^4=CR^4-$;

L_2 is unsubstituted or substituted C_{2-3} alkylene chain, where one carbon atom may be replaced with $-CR^4=CR^4-$;

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V_1 is $-\text{C}(\text{O})-$, $-\text{C}(\text{S})-$, $-\text{C}(\text{O})-\text{N}(\text{R}^{4a})-$, $-\text{C}(\text{O})-\text{O}-$, or $-\text{S}(\text{O})_2-$;

V_2 is $-\text{C}(\text{O})-$, $-\text{C}(\text{S})-$, $-\text{N}(\text{R}^{4a})-$, $-\text{C}(\text{O})-\text{N}(\text{R}^{4a})-$, $-\text{N}(\text{R}^{4a})-\text{C}(\text{O})-$, $-\text{SO}_2-\text{N}(\text{R}^{4a})-$, $-\text{N}(\text{R}^{4a})-\text{SO}_2-$, $-\text{C}(\text{O})-\text{O}-$, $-\text{O}-\text{C}(\text{O})-$, $-\text{O}-$, $-\text{S}-$, $-\text{S}(\text{O})-$, $-\text{S}(\text{O})_2-$, $-\text{N}(\text{R}^{4a})-\text{C}(\text{O})-\text{N}(\text{R}^{4a})-$, $-\text{N}(\text{R}^{4a})-\text{C}(\text{O})-\text{O}-$, $-\text{O}-\text{C}(\text{O})-\text{N}(\text{R}^{4a})-$, or $-\text{N}(\text{R}^{4a})-\text{SO}_2-\text{N}(\text{R}^{4a})-$;

R^3 is unsubstituted or substituted C_{1-6} aliphatic, unsubstituted or substituted 3-10-membered cycloaliphatic, unsubstituted or substituted 4-10-membered heterocyclyl having 1-4 heteroatoms independently selected from nitrogen, oxygen, and sulfur, unsubstituted or substituted 6-10-membered aryl, or unsubstituted or substituted 5-10-membered heteroaryl having 1-4 heteroatoms independently selected from nitrogen, oxygen, and sulfur;

each occurrence of R^4 is independently hydrogen, fluoro, or unsubstituted or substituted C_{1-4} aliphatic;

each occurrence of R^{4a} is independently hydrogen, or unsubstituted or substituted C_{1-4} aliphatic;

ring B is optionally further substituted with m occurrences of R^1 ;

each occurrence of R^1 is independently chloro, fluoro, $-\text{O}-\text{C}_{1-4}$ alkyl, cyano, hydroxy, C_{1-4} alkyl, or C_{1-4} fluoroalkyl;

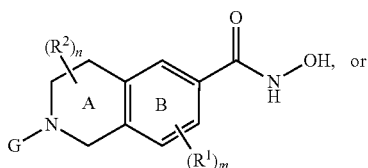
ring A is optionally further substituted with n occurrences of R^2 ;

each occurrence of R^2 is independently fluoro, C_{1-4} alkyl, or C_{1-4} fluoroalkyl;

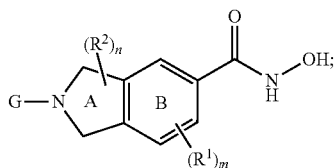
m is 0-2; and

n is 0-4.

In another aspect of the present invention, the compounds of the invention are represented by formula (II-A) or (II-B):



(II-A)



(II-B)

or a pharmaceutically acceptable salt thereof;

wherein:

G is $-\text{R}^3$, $-\text{V}_1-\text{R}^3$, $-\text{V}_1-\text{L}_1-\text{R}^3$, $-\text{L}_1-\text{V}_2-\text{R}^3$, $-\text{L}_1-\text{R}^3$, or $-\text{L}_1-\text{V}_2-\text{L}_2-\text{R}^3$;

L_1 and L_2 are each independently unsubstituted or substituted C_{1-3} alkylene chain, where one carbon atom may be replaced with $-\text{CR}^d=\text{CR}^d-$;

V_1 is $-\text{S}(\text{O})_2-$;

V_2 is $-\text{C}(\text{O})-$, $-\text{C}(\text{S})-$, $-\text{N}(\text{R}^{4a})-$, $-\text{C}(\text{O})-\text{N}(\text{R}^{4a})-$, $-\text{N}(\text{R}^{4a})-\text{C}(\text{O})-$, $-\text{SO}_2-\text{N}(\text{R}^{4a})-$, $-\text{N}(\text{R}^{4a})-\text{SO}_2-$, $-\text{C}(\text{O})-\text{O}-$, $-\text{O}-\text{C}(\text{O})-$, $-\text{O}-$, $-\text{S}-$, $-\text{S}(\text{O})-$, $-\text{S}(\text{O})_2-$, $-\text{N}(\text{R}^{4a})-\text{C}(\text{O})-\text{N}(\text{R}^{4a})-$, $-\text{N}(\text{R}^{4a})-\text{C}(\text{O})-\text{O}-$, $-\text{O}-\text{C}(\text{O})-\text{N}(\text{R}^{4a})-$, or $-\text{N}(\text{R}^{4a})-\text{SO}_2-\text{N}(\text{R}^{4a})-$;

R^3 is unsubstituted or substituted C_{1-6} aliphatic, unsubstituted or substituted 3-10-membered cycloaliphatic, unsubstituted or substituted 4-10-membered heterocyclyl having 1-4 heteroatoms independently selected from nitrogen, oxygen, and sulfur, unsubstituted or substituted 6-10-membered aryl, or unsubstituted or substituted 5-10-membered heteroaryl having 1-4 heteroatoms independently selected from nitrogen, oxygen, and sulfur;

each occurrence of R^d is independently hydrogen, halo, or an optionally substituted C_{1-4} aliphatic group;

each occurrence of R^{4a} is independently hydrogen, or an optionally substituted C_{1-4} aliphatic group;

ring B is optionally further substituted with m occurrences of R^1 ;

each occurrence of R^1 is independently halo, C_{1-3} alkyl, C_{1-3} haloalkyl, $-\text{O}-\text{C}_{1-3}$ alkyl, $-\text{O}-\text{C}_{1-3}$ haloalkyl, $-\text{CN}$, $-\text{NHC}(\text{O})\text{C}_{1-3}$ alkyl, $-\text{NHC}(\text{O})\text{NHC}_{1-3}$ alkyl, or $\text{NHS}(\text{O})_2\text{C}_{1-3}$ alkyl;

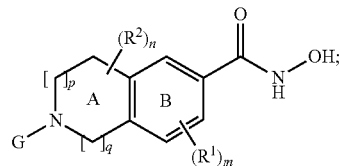
ring A is optionally further substituted with n occurrences of R^2 ;

each occurrence of R^2 is independently halo, C_{1-3} alkyl, C_{1-3} haloalkyl, $-\text{O}-\text{C}_{1-3}$ alkyl, $-\text{O}-\text{C}_{1-3}$ haloalkyl, $-\text{NHC}(\text{O})\text{C}_{1-3}$ alkyl, $-\text{NHC}(\text{O})\text{NHC}_{1-3}$ alkyl, or $\text{NHS}(\text{O})_2\text{C}_{1-3}$ alkyl;

m is 0-2; and

n is 0-4.

In another aspect of the present invention, the compounds of the invention are represented by formula (I):



(I)

or a pharmaceutically acceptable salt thereof;

wherein:

p is 0 and q is 1; or p is 1 and q is 1;

G is $-\text{R}^3$, $-\text{V}_1-\text{R}^3$, $-\text{V}_1-\text{L}_1-\text{R}^3$, $-\text{L}_1-\text{V}_1-\text{R}^3$, $-\text{L}_2-\text{V}_2-\text{R}^3$, $-\text{V}_1-\text{L}_1-\text{V}_2-\text{R}^3$, or $-\text{L}_1-\text{R}^3$;

L_1 is an optionally substituted C_{1-3} alkylene chain, where one carbon atom may be replaced with $-\text{CR}^d=\text{CR}^d-$;

L_2 is an optionally substituted C_{2-3} alkylene chain, where one carbon atom may be replaced with $-\text{CR}^d=\text{CR}^d-$;

V_1 is $-\text{C}(\text{S})-$ or $-\text{S}(\text{O})_2-$;

V_2 is $-\text{C}(\text{O})-$, $-\text{C}(\text{S})-$, $-\text{N}(\text{R}^{4a})-$, $-\text{C}(\text{O})-\text{N}(\text{R}^{4a})-$, $-\text{N}(\text{R}^{4a})-\text{C}(\text{O})-$, $-\text{SO}_2-\text{N}(\text{R}^{4a})-$, $-\text{N}(\text{R}^{4a})-\text{SO}_2-$, $-\text{O}-\text{C}(\text{O})-$, $-\text{O}-$, $-\text{S}-$, $-\text{S}(\text{O})-$, $-\text{S}(\text{O})_2-$, $-\text{N}(\text{R}^{4a})-\text{C}(\text{O})-\text{N}(\text{R}^{4a})-$, $-\text{N}(\text{R}^{4a})-\text{C}(\text{O})-\text{O}-$, $-\text{O}-\text{C}(\text{O})-\text{N}(\text{R}^{4a})-$, or $-\text{N}(\text{R}^{4a})-\text{SO}_2-\text{N}(\text{R}^{4a})-$;

R^3 is unsubstituted or substituted C_{1-6} aliphatic, unsubstituted or substituted 3-10-membered cycloaliphatic, unsubstituted or substituted 4-10-membered heterocyclyl having 1-4 heteroatoms independently selected from nitrogen, oxygen, and sulfur, unsubstituted or substituted 6-10-membered aryl, or unsubstituted or substituted 5-10-membered heteroaryl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur;

each occurrence of R^d is independently hydrogen, fluoro, or unsubstituted or substituted C_{1-4} aliphatic;

each occurrence of R^{4a} is independently hydrogen, or unsubstituted or substituted C_{1-4} aliphatic;

ring B is optionally further substituted with m occurrences of R^1 ;

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each occurrence of R^1 is independently chloro, fluoro, $-O-C_{1-4}$ alkyl, cyano, hydroxy, C_{1-4} alkyl, or C_{1-4} fluoroalkyl;

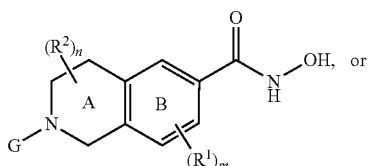
ring A is optionally further substituted with n occurrences of R^2 ;

each occurrence of R^2 is independently fluoro, C_{1-4} alkyl, or C_{1-4} fluoroalkyl;

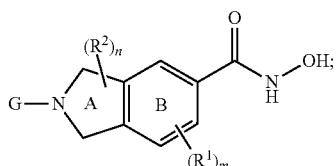
m is 0-2; and

n is 0-4.

In another aspect of the present invention, the compounds of the invention are represented by formula (II-A) or (II-B):



(II-A)



(II-B)

or a pharmaceutically acceptable salt thereof; wherein:

G is $-C(R^6)(R^6)-R^3$, $-C(O)-[C(R^6)(R^6)]_u-R^3$, or $-C(O)-NH-[C(R^6)(R^6)]_u-R^3$;

R^6 is hydrogen, C_{1-4} aliphatic, C_{3-6} cycloaliphatic, or 6-10-membered aryl;

$R^{6'}$ is hydrogen, C_{1-4} aliphatic, C_{3-6} cycloaliphatic, or 6-10-membered aryl; or

R^6 and $R^{6'}$ are taken together to form a C_{3-6} cycloaliphatic group;

wherein at least one occurrence of R^6 is $R^{6''}$;

$R^{6''}$ is C_{1-4} aliphatic, C_{3-6} cycloaliphatic, or 6-10-membered aryl;

R^3 is $-R^{3d}$;

R^{3d} is unsubstituted or substituted C_{1-6} aliphatic, unsubstituted or substituted 3-10-membered cycloaliphatic, unsubstituted or substituted 4-10-membered heterocyclyl having 1-4 heteroatoms independently selected from nitrogen, oxygen, and sulfur, unsubstituted or substituted 6-10-membered aryl, or unsubstituted or substituted 5-10-membered heteroaryl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur; wherein R^{3d} if substituted is substituted with 0-2 independent occurrences of $-R^{5a}$;

each occurrence of R^{5a} is independently halogen, C_{1-3} aliphatic, $-CN$, $-NO_2$, $-N(R^{5b})_2$, $-OR^{5b}$, $-SR^{5c}$, $-S(O)_2R^{5c}$, $-S(O)R^{5c}-C(O)R^{5b}$, $-C(O)OR^{5b}$, $-C(O)N(R^{5b})_2$, $-S(O)_2N(R^{5b})_2$, $-OC(O)N(R^{5b})_2$, $-N(R^{5e})C(O)R^{5b}$, $-N(R^{5e})SO_2R^{5e}$, $-N(R^{5e})C(O)OR^{5b}$, $-N(R^{5e})C(O)N(R^{5b})_2$, or $-N(R^{5e})SO_2N(R^{5b})_2$, or a C_{1-4} aliphatic substituted with R^{5dd} , halogen, $-CN$, $-NO_2$, $-N(R^{5b})_2$, $-OR^{5b}$, $-SR^{5e}$, $-S(O)_2R^{5e}$, $-S(O)R^{5e}$, $-C(O)R^{5b}$, $-C(O)OR^{5b}$, $-C(O)N(R^{5b})_2$, $-S(O)_2N(R^{5b})_2$, $-OC(O)N(R^{5b})_2$, $-N(R^{5e})C(O)R^{5b}$, $-N(R^{5e})SO_2R^{5e}$, $-N(R^{5e})C(O)OR^{5b}$, $-N(R^{5e})C(O)N(R^{5b})_2$, or $-N(R^{5e})SO_2N(R^{5b})_2$;

each occurrence of R^{5b} is independently hydrogen or an optionally substituted group selected from C_{1-6} aliphatic, 3-10-membered cycloaliphatic, 4-10-membered heterocyclyl having 1-4 heteroatoms independently selected from nitrogen, oxygen, and sulfur, 6-10-membered aryl, or 5-10-membered heteroaryl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur; or two occurrences of R^{5b} on the same nitrogen atom can be taken together with the nitrogen atom to which they are bound to form an optionally substituted 4-7-membered heterocyclyl ring having 0-1 additional heteroatoms selected from nitrogen, oxygen, and sulfur;

each occurrence of R^{5e} is independently an optionally substituted group selected from C_{1-6} aliphatic, 3-10-membered cycloaliphatic, 4-10-membered heterocyclyl having 1-4 heteroatoms independently selected from nitrogen, oxygen, and sulfur, 6-10-membered aryl, or 5-10-membered heteroaryl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur;

each occurrence of R^{5dd} is an optionally substituted group selected from 6-10-membered aryl, or 5-10-membered heteroaryl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur;

each occurrence of R^{5e} is independently hydrogen or an optionally substituted C_{1-6} aliphatic group;

u is 1-2;

ring B is optionally further substituted with m occurrences of R^1 ;

each occurrence of R^1 is independently halo, C_{1-3} alkyl, C_{1-3} haloalkyl, $-O-C_{1-3}$ alkyl, $-O-C_{1-3}$ haloalkyl, $-CN$, $-NHC(O)C_{1-3}$ alkyl, $-NHC(O)NHC_{1-3}$ alkyl, or $NHS(O)_2C_{1-3}$ alkyl;

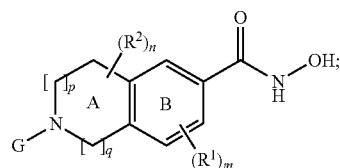
ring A is optionally further substituted with n occurrences of R^2 ;

each occurrence of R^2 is independently halo, C_{1-3} alkyl, C_{1-3} haloalkyl, $-O-C_{1-3}$ alkyl, $-O-C_{1-3}$ haloalkyl, $-NHC(O)C_{1-3}$ alkyl, $-NHC(O)NHC_{1-3}$ alkyl, or $NHS(O)_2C_{1-3}$ alkyl;

m is 0-2; and

n is 0-4.

In another aspect of the present invention, the compounds of the invention are represented by formula (I):



(I)

or a pharmaceutically acceptable salt thereof;

wherein:

p is 0 and g is 1; or p is 1 and q is 1;

G is $-C(O)-[C(R^6)(R^6)]_{zz}-R^{3g}$, $-C(O)-N(R^{4a})-[C(R^6)(R^6)]_{zz}-R^{3g}$, $-C(O)-O-[C(R^6)(R^6)]_{zz}-R^{3g}$, $-C(O)-C(R^6)(R^6)-V_{2a}-R^{3g}$, $-C(O)-[C(R^6)(R^6)]_{yy}-V_{2a}-R^{3g}$, $-C(O)-N(R^{4a})-[C(R^6)(R^6)]_{yy}-V_{2a}-R^{3g}$, or $-C(O)-O-[C(R^6)(R^6)]_{yy}-V_{2a}-R^{3g}$;

R^6 is hydrogen, C_{1-4} aliphatic, C_{3-6} cycloaliphatic, or 6-10-membered aryl;

$R^{6'}$ is hydrogen, C_{1-4} aliphatic, C_{3-6} cycloaliphatic, or 6-10-membered aryl; or

R^6 and $R^{6'}$ are taken together to form a C_{3-6} cycloaliphatic group;

wherein at least one occurrence of R^6 is $R^{6''}$;

$R^{6''}$ is C_{1-4} aliphatic, C_{3-6} cycloaliphatic, or 6-10-membered aryl;

V_{2a} is $-C(O)-$, $-O-$, $-S-$, $-N(R^{4a})-$, or $-C(O)N(R^{4a})-$;

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$V_{2a'}$ is —O—, —S—, or —N(R^{4a})—;

R^{3g} is unsubstituted or substituted C₁₋₆ aliphatic, unsubstituted or substituted 3-10-membered cycloaliphatic, unsubstituted or substituted 4-10-membered heterocyclyl having 1-4 heteroatoms independently selected from nitrogen, oxygen, and sulfur, unsubstituted or substituted 6-10-membered aryl, or unsubstituted or substituted 5-10-membered heteroaryl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur;

R^{3g'} is unsubstituted or substituted 3-10-membered cycloaliphatic, unsubstituted or substituted 4-10-membered heterocyclyl having 1-4 heteroatoms independently selected from nitrogen, oxygen, and sulfur, unsubstituted or substituted 6-10-membered aryl, or unsubstituted or substituted 5-10-membered heteroaryl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur;

R^{4a} is independently hydrogen, or unsubstituted or substituted C₁₋₄ aliphatic;

ring B is optionally further substituted with m occurrences of R¹;

each occurrence of R¹ is independently chloro, fluoro, —O—C₁₋₄ alkyl, cyano, hydroxy, C₁₋₄ alkyl, or C₁₋₄ fluoroalkyl;

ring A is optionally further substituted with n occurrences of R²;

each occurrence of R² is independently fluoro, C₁₋₄ alkyl, or C₁₋₄ fluoroalkyl;

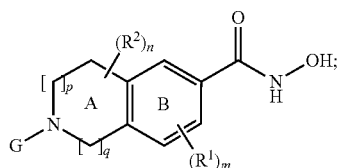
zz is 1-3;

yy is 2-3;

m is 0-2; and

n is 0-4.

In another aspect of the present invention, the compounds of the invention are represented by formula (I):



or a pharmaceutically acceptable salt thereof; wherein:

p is 0 and q is 1; or p is 1 and q is 1;

G is —C(O)—(CH₂)_{zz}—R^{3e}, —C(O)—N(R^{4a})—(CH₂)_{zz}—R^{3e}, —C(O)—O—(CH₂)_{zz}—R^{3e}, —C(O)—CH₂—V_{2a'}—R^{3e}, —C(O)—(CH₂)_{yy}—V_{2a}—R^{3e}, —C(O)—N(R^{4a})—(CH₂)_{yy}—V_{2a}—R^{3e}, or —C(O)—O—(CH₂)_{yy}—V_{2a}—R^{3e};

R^{3e} is unsubstituted or substituted 7-10-membered cycloaliphatic, unsubstituted or substituted 7-10 membered heterocyclyl having 1-4 heteroatoms independently selected from nitrogen, oxygen, and sulfur, or unsubstituted or substituted 5-10-membered heteroaryl having 3-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur;

V_{2a} is —C(O)—, —O—, —S—, —N(R^{4a})—, or —C(O)N(R^{4a})—;

V_{2a'} is —O—, —S—, or —N(R^{4a})—;

each occurrence of R^{4a} is independently hydrogen, or unsubstituted or substituted C₁₋₄ aliphatic;

ring B is optionally further substituted with m occurrences of R¹;

each occurrence of R¹ is independently chloro, fluoro, —O—C₁₋₄ alkyl, cyano, hydroxy, C₁₋₄ alkyl, or C₁₋₄ fluoroalkyl;

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ring A is optionally further substituted with n occurrences of R²;

each occurrence of R² is independently fluoro, C₁₋₄ alkyl, or C₁₋₄ fluoroalkyl;

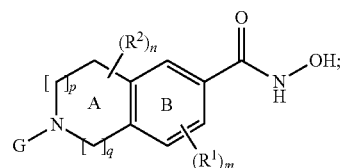
zz is 0-3;

yy is 2-3;

m is 0-2; and

n is 0-4.

In another aspect of the present invention, the compounds of the invention are represented by formula (I):



or a pharmaceutically acceptable salt thereof; wherein:

p is 0 and q is 1; or p is 1 and q is 1;

G is —C(O)—(CH₂)_{zz}—R^{3f}, —C(O)—N(R^{4a})—(CH₂)_{zz}—R^{3f}, —C(O)—O—(CH₂)_{zz}—R^{3f}, —C(O)—CH₂—V_{2a'}—R^{3f}, —C(O)—(CH₂)_{yy}—V_{2a}—R^{3f}, —C(O)—N(R^{4a})—(CH₂)_{yy}—V_{2a}—R^{3f}, or —C(O)—O—(CH₂)_{yy}—V_{2a}—R^{3f};

R^{3f} is substituted C₁₋₆ aliphatic, substituted 3-6-membered cycloaliphatic, substituted 4-6-membered heterocyclyl having 1-2 heteroatoms independently selected from nitrogen, oxygen, and sulfur, substituted 6-10-membered aryl, or substituted 5-10-membered heteroaryl having 1-2 heteroatoms independently selected from nitrogen, oxygen, and sulfur; wherein R^{3f} is substituted with 1-2 independent occurrences of R^{5aa};

each occurrence of R^{5aa} is independently cyano, hydroxy, C₁₋₆ aliphatic substituted with 1-2 occurrences of R⁷ or R⁸, C₁₋₆ fluoroalkyl, —O—C₁₋₆ fluoroalkyl, —NHC(O)C₁₋₆ alkyl, —NHC(O)C₃₋₆ cycloalkyl, —C(O)NHC₁₋₆ alkyl, —NHC(O)NHC₁₋₆ alkyl, —NHS(O)₂C₁₋₆ alkyl, —NHC₁₋₆ alkyl, —N(C₁₋₆ alkyl)₂, or phenyl substituted with 1-2 occurrences of —R^{7a};

each occurrence of R⁷ is independently unsubstituted or substituted 4-10-membered heterocyclyl having 1-4 heteroatoms independently selected from nitrogen, oxygen, and sulfur, unsubstituted or substituted 6-10-membered aryl, or unsubstituted or substituted 5-10-membered heteroaryl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur;

each occurrence of R⁸ is independently chloro, fluoro, —OH, —O(C₁₋₆ alkyl), —CN, —N(C₁₋₆ alkyl)₂, —NH(C₁₋₆ alkyl), —C(O)(C₁₋₆ alkyl), —CO₂H, —CO₂(C₁₋₆ alkyl), —C(O)NH₂, or —C(O)NH(C₁₋₆ alkyl);

each occurrence of R^{7a} is independently chloro, fluoro, bromo, iodo, C₁₋₆ alkyl, C₁₋₆ fluoroalkyl, —O—C₁₋₆ alkyl, —O—C₁₋₆ fluoroalkyl, cyano, hydroxy, —NHC(O)C₁₋₆ alkyl, —NHC₁₋₆ alkyl, —N(C₁₋₆ alkyl)₂, —C(O)NHC₁₋₆ alkyl, —C(O)N(C₁₋₆ alkyl)₂, —NHC(O)NHC₁₋₆ alkyl, —NHC(O)N(C₁₋₆ alkyl)₂, or —NHS(O)₂C₁₋₆ alkyl;

V_{2a} is —C(O)—, —O—, —S—, —N(R^{4a})—, or —C(O)N(R^{4a})—;

V_{2a'} is —O—, —S—, or —N(R^{4a})—;

each occurrence of R^{4a} is independently hydrogen, or unsubstituted or substituted C₁₋₄ aliphatic;

ring B is optionally further substituted with m occurrences of R¹;

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each occurrence of R^1 is independently chloro, fluoro, $-\text{O}-\text{C}_{1-4}$ alkyl, cyano, hydroxy, C_{1-4} alkyl, or C_{1-4} fluoroalkyl;

ring A is optionally further substituted with n occurrences of R^2 ;

each occurrence of R^2 is independently fluoro, C_{1-4} alkyl, or C_{1-4} fluoroalkyl;

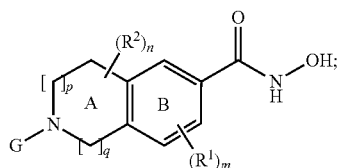
zz is 0-3;

yy is 2-3;

m is 0-2; and

n is 0-4.

In another aspect of the present invention, the compounds of the invention are represented by formula (I):



or a pharmaceutically acceptable salt thereof; wherein:

p is 0 and q is 1; or p is 1 and q is 1;

G is $-\text{C}(\text{O})-(\text{CH}_2)_{zz}-\text{R}^{3h}$, $-\text{C}(\text{O})-\text{N}(\text{R}^{4a})-(\text{CH}_2)_{zz}-\text{R}^{3h}$, $-\text{C}(\text{O})-\text{O}-(\text{CH}_2)_{zz}-\text{R}^{3h}$, $-\text{C}(\text{O})-\text{CH}_2-\text{V}_{2a}-\text{R}^{3h}$, $-\text{C}(\text{O})-(\text{CH}_2)_{yy}-\text{V}_{2a}-\text{R}^{3h}$, $-\text{C}(\text{O})-\text{N}(\text{R}^{4a})-(\text{CH}_2)_{yy}-\text{V}_{2a}-\text{R}^{3h}$, or $-\text{C}(\text{O})-\text{O}-(\text{CH}_2)_{yy}-\text{V}_{2a}-\text{R}^{3h}$;

R^{3h} is unsubstituted or substituted C_{1-6} aliphatic, unsubstituted or substituted 3-6-membered cycloaliphatic, unsubstituted or substituted 4-6-membered heterocyclyl having 1-2 heteroatoms independently selected from nitrogen, oxygen, and sulfur, unsubstituted or substituted 6-10-membered aryl, or substituted 5-10-membered heteroaryl having 1-2 heteroatoms independently selected from nitrogen, oxygen, and sulfur; wherein R^{3h} if substituted is substituted with 0-2 occurrences of R^{5aaa} ;

each occurrence of R^{5aaa} is independently chloro, fluoro, C_{1-4} alkyl, $-\text{O}-\text{C}_{1-6}$ alkyl, or phenyl;

V_{2a} is $-\text{C}(\text{O})-$, $-\text{O}-$, $-\text{S}-$, $-\text{N}(\text{R}^{4a})-$, or $-\text{C}(\text{O})\text{N}(\text{R}^{4a})-$;

$\text{V}_{2a'}$ is $-\text{O}-$, $-\text{S}-$, or $-\text{N}(\text{R}^{4a})-$;

each occurrence of R^{4a} is independently hydrogen, or unsubstituted or substituted C_{1-4} aliphatic;

ring B is optionally further substituted with m occurrences of R^1 ;

each occurrence of R^1 is independently chloro, fluoro, $-\text{O}-\text{C}_{1-4}$ alkyl, cyano, hydroxy, C_{1-4} alkyl, or C_{1-4} fluoroalkyl;

ring A is optionally further substituted with n occurrences of R^2 ;

each occurrence of R^2 is independently fluoro, C_{1-4} alkyl, or C_{1-4} fluoroalkyl;

zz is 0-3;

yy is 2-3;

m is 0-2;

n is 0-4; and

the total of m and n must be at least 1.

2. Compounds and Definitions

Compounds of this invention include those described generally for formula (I) above, and are further illustrated by the

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classes, subclasses, and species disclosed herein. As used herein, the following definitions shall apply unless otherwise indicated.

As described herein, compounds of the invention may be optionally substituted with one or more substituents, such as are illustrated generally above, or as exemplified by particular classes, subclasses, and species of the invention. It will be appreciated that the phrase "optionally substituted" is used interchangeably with the phrase "substituted or unsubstituted." In general, the term "substituted", whether preceded by the term "optionally" or not, means that a hydrogen radical of the designated moiety is replaced with the radical of a specified substituent, provided that the substitution results in a stable or chemically feasible compound. The term "substitutable", when used in reference to a designated atom, means that attached to the atom is a hydrogen radical, which hydrogen atom can be replaced with the radical of a suitable substituent. Unless otherwise indicated, an "optionally substituted" group may have a substituent at each substitutable position of the group, and when more than one position in any given structure may be substituted with more than one substituent selected from a specified group, the substituent may be either the same or different at every position. Combinations of substituents envisioned by this invention are preferably those that result in the formation of stable or chemically feasible compounds.

A stable compound or chemically feasible compound is one in which the chemical structure is not substantially altered when kept at a temperature from about -80°C . to about $+40^\circ\text{C}$. in the absence of moisture or other chemically reactive conditions, for at least a week, or a compound which maintains its integrity long enough to be useful for therapeutic or prophylactic administration to a patient.

The phrase "one or more substituents", as used herein, refers to a number of substituents that equals from one to the maximum number of substituents possible based on the number of available bonding sites, provided that the above conditions of stability and chemical feasibility are met.

As used herein, the term "independently selected" means that the same or different values may be selected for multiple instances of a given variable in a single compound.

As used herein, the term "aromatic" includes aryl and heteroaryl groups as described generally below and herein.

The term "aliphatic" or "aliphatic group", as used herein, means an optionally substituted straight-chain or branched C_{1-12} hydrocarbon, or a cyclic C_{1-12} hydrocarbon which is completely saturated or which contains one or more units of unsaturation, but which is not aromatic (also referred to herein as "carbocycle", "cycloaliphatic", "cycloalkyl", or "cycloalkenyl"). For example, suitable aliphatic groups include optionally substituted linear, branched or cyclic alkyl, alkenyl, alkynyl groups and hybrids thereof, such as (cycloalkyl)alkyl, (cycloalkenyl)alkyl, or (cycloalkyl)alkenyl. Unless otherwise specified, in various embodiments, aliphatic groups have 1-12, 1-10, 1-8, 1-6, 1-4, 1-3, or 1-2 carbon atoms.

The term "alkyl", used alone or as part of a larger moiety, refers to an optionally substituted straight or branched chain hydrocarbon group having 1-12, 1-10, 1-8, 1-6, 1-4, 1-3, or 1-2 carbon atoms.

The term "alkenyl", used alone or as part of a larger moiety, refers to an optionally substituted straight or branched chain hydrocarbon group having at least one double bond and having 2-12, 2-10, 2-8, 2-6, 2-4, or 2-3 carbon atoms.

The term "alkynyl", used alone or as part of a larger moiety, refers to an optionally substituted straight or branched chain

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hydrocarbon group having at least one triple bond and having 2-12, 2-10, 2-8, 2-6, 2-4, or 2-3 carbon atoms.

The terms "cycloaliphatic", "carbocycle", "carbocyclyl", "carbocyclo", or "carbocyclic", used alone or as part of a larger moiety, refer to an optionally substituted saturated or partially unsaturated cyclic aliphatic ring system having from 3 to about 14 ring carbon atoms. In some embodiments, the cycloaliphatic group is an optionally substituted monocyclic hydrocarbon having 3-8 or 3-6 ring carbon atoms. Cycloaliphatic groups include, without limitation, optionally substituted cyclopropyl, cyclobutyl, cyclopentyl, cyclopentenyl, cyclohexyl, cyclohexenyl, cycloheptyl, cycloheptenyl, cyclooctyl, cyclooctenyl, or cyclooctadienyl. The terms "cycloaliphatic", "carbocycle", "carbocyclyl", "carbocyclo", or "carbocyclic" also include optionally substituted bridged or fused bicyclic rings having 6-12, 6-10, or 6-8 ring carbon atoms, wherein any individual ring in the bicyclic system has 3-8 ring carbon atoms.

The term "cycloalkyl" refers to an optionally substituted saturated ring system of about 3 to about 10 ring carbon atoms. Exemplary monocyclic cycloalkyl rings include cyclopropyl, cyclobutyl, cyclopentyl, cyclohexyl, and cycloheptyl.

The term "cycloalkenyl" refers to an optionally substituted non-aromatic monocyclic or multicyclic ring system containing at least one carbon-carbon double bond and having about 3 to about 10 carbon atoms. Exemplary monocyclic cycloalkenyl rings include cyclopentyl, cyclohexenyl, and cycloheptenyl.

The terms "haloaliphatic", "haloalkyl", "haloalkenyl" and "haloalkoxy" refer to an aliphatic, alkyl, alkenyl or alkoxy group, as the case may be, which is substituted with one or more halogen atoms. As used herein, the term "halogen" or "halo" means F, Cl, Br, or I. The term "fluoroaliphatic" refers to a haloaliphatic wherein the halogen is fluoro, including perfluorinated aliphatic groups. Examples of fluoroaliphatic groups include, without limitation, fluoromethyl, difluoromethyl, trifluoromethyl, 2-fluoroethyl, 2,2,2-trifluoroethyl, 1,1,2-trifluoroethyl, 1,2,2-trifluoroethyl, and pentafluoroethyl.

The term "heteroatom" refers to one or more of oxygen, sulfur, nitrogen, phosphorus, or silicon (including, any oxidized form of nitrogen, sulfur, phosphorus, or silicon; the quaternized form of any basic nitrogen or; a substitutable nitrogen of a heterocyclic ring, for example N (as in 3,4-dihydro-2H-pyrrolyl), NH (as in pyrrolidinyl) or NR⁺ (as in N-substituted pyrrolidinyl)).

The terms "aryl" and "ar-", used alone or as part of a larger moiety, e.g., "aralkyl", "aralkoxy", or "aryloxyalkyl", refer to an optionally substituted C₆-14 aromatic hydrocarbon moiety comprising one to three aromatic rings. Preferably, the aryl group is a C₆-10 aryl group. Aryl groups include, without limitation, optionally substituted phenyl, naphthyl, or anthracenyl. The terms "aryl" and "ar-", as used herein, also include groups in which an aryl ring is fused to one or more cycloaliphatic rings to form an optionally substituted cyclic structure such as a tetrahydronaphthyl, indenyl, or indanyl ring. The term "aryl" may be used interchangeably with the terms "aryl group", "aryl ring", and "aromatic ring".

An "aralkyl" or "arylalkyl" group comprises an aryl group covalently attached to an alkyl group, either of which independently is optionally substituted. Preferably, the aralkyl group is C₆-10 arylC₁-6 alkyl, including, without limitation, benzyl, phenethyl, and naphthylmethyl.

The terms "heteroaryl" and "heteroar-", used alone or as part of a larger moiety, e.g., "heteroaralkyl", or "heteroaralkoxy", refer to groups having 5 to 14 ring atoms, preferably 5, 6, 9, or 10 ring atoms; having 6, 10, or 14 π

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electrons shared in a cyclic array; and having, in addition to carbon atoms, from one to five heteroatoms. In some embodiments, the heteroaryl group has 5-10 ring atoms, having, in addition to carbon atoms, from one to five heteroatoms. A heteroaryl group may be mono-, bi-, tri-, or polycyclic, preferably mono-, bi-, or tricyclic, more preferably mono- or bicyclic. The term "heteroatom" refers to nitrogen, oxygen, or sulfur, and includes any oxidized form of nitrogen or sulfur, and any quaternized form of a basic nitrogen. For example, a nitrogen atom of a heteroaryl may be a basic nitrogen atom and may also be optionally oxidized to the corresponding N-oxide. When a heteroaryl is substituted by a hydroxy group, it also includes its corresponding tautomer. The terms "heteroaryl" and "heteroar-", as used herein, also include groups in which a heteroaromatic ring is fused to one or more aryl, cycloaliphatic, or heterocycloaliphatic rings. Nonlimiting examples of heteroaryl groups include thienyl, furanyl, pyrrolyl, imidazolyl, pyrazolyl, triazolyl, tetrazolyl, oxazolyl, isoxazolyl, oxadiazolyl, thiazolyl, isothiazolyl, thiadiazolyl, pyridyl, pyridazinyl, pyrimidinyl, pyrazinyl, indolizyl, purinyl, naphthyridinyl, pteridinyl, indolyl, isoindolyl, benzothienyl, benzofuranyl, dibenzofuranyl, indazolyl, benzimidazolyl, benzthiazolyl, quinolyl, isoquinolyl, cinnolyl, phthalazinyl, quinazolinyl, quinoxalinyl, 4H-quinolizyl, carbazolyl, acridinyl, phenazinyl, phenothiazinyl, phenoxazinyl, tetrahydroquinolyl, tetrahydroisoquinolyl, and pyrido[2,3-b]-1,4-oxazin-3(4H)-one. The term "heteroaryl" may be used interchangeably with the terms "heteroaryl ring", "heteroaryl group", or "heteroaromatic", any of which terms include rings that are optionally substituted. The term "heteroaralkyl" refers to an alkyl group substituted by a heteroaryl, wherein the alkyl and heteroaryl portions independently are optionally substituted.

As used herein, the terms "heterocycle", "heterocyclyl", "heterocyclic radical", and "heterocyclic ring" are used interchangeably and refer to a stable 4-10 membered ring, preferably a 3- to 8-membered monocyclic or 7-10-membered bicyclic heterocyclic moiety that is either saturated or partially unsaturated, and having, in addition to carbon atoms, one or more, preferably one to four, heteroatoms, as defined above. When used in reference to a ring atom of a heterocycle, the term "nitrogen" includes a substituted nitrogen. As an example, in a saturated or partially unsaturated ring having 0-3 heteroatoms selected from oxygen, sulfur or nitrogen, the nitrogen may be N (as in 3,4-dihydro-2H-pyrrolyl), NH (as in pyrrolidinyl), or NR⁺ (as in N-substituted pyrrolidinyl).

A heterocyclic ring can be attached to its pendant group at any heteroatom or carbon atom that results in a stable structure and any of the ring atoms can be optionally substituted. Examples of such saturated or partially unsaturated heterocyclic radicals include, without limitation, tetrahydrofuran, tetrahydrothienyl, piperidinyl, decahydroquinolyl, oxazolidinyl, piperazinyl, dioxanyl, dioxolanyl, diazepinyl, oxazepinyl, thiazepinyl, morpholinyl, and thiamorpholinyl. A heterocyclyl group may be mono-, bi-, tri-, or polycyclic, preferably mono-, bi-, or tricyclic, more preferably mono- or bicyclic. The term "heterocyclylalkyl" refers to an alkyl group substituted by a heterocyclyl, wherein the alkyl and heterocyclyl portions independently are optionally substituted. Additionally, a heterocyclic ring also includes groups in which the heterocyclic ring is fused to one or more aryl rings.

As used herein, the term "partially unsaturated" refers to a ring moiety that includes at least one double or triple bond between ring atoms. The term "partially unsaturated" is intended to encompass rings having multiple sites of unsaturation.

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uration, but is not intended to include aromatic (e.g., aryl or heteroaryl) moieties, as herein defined.

The term "alkylene" refers to a bivalent alkyl group. An "alkylene chain" is a polymethylene group, i.e., $-(CH_2)_n-$, wherein n is a positive integer, preferably from 1 to 6, from 1 to 4, from 1 to 3, from 1 to 2, or from 2 to 3. An optionally substituted alkylene chain is a polymethylene group in which one or more methylene hydrogen atoms is optionally replaced with a substituent. Suitable substituents include those described below for a substituted aliphatic group and also include those described in the specification herein. It will be appreciated that two substituents of the alkylene group may be taken together to form a ring system. In certain embodiments, two substituents can be taken together to form a 3-7-membered ring. The substituents can be on the same or different atoms.

An alkylene chain also can be optionally interrupted by a functional group. An alkylene chain is "interrupted" by a functional group when an internal methylene unit is interrupted by the functional group. Examples of suitable "interrupting functional groups" are described in the specification and claims herein.

For purposes of clarity, all bivalent groups described herein, including, e.g., the alkylene chain linkers described above, are intended to be read from left to right, with a corresponding left-to-right reading of the formula or structure in which the variable appears.

An aryl (including aralkyl, aralkoxy, aryloxyalkyl and the like) or heteroaryl (including heteroaralkyl and heteroarylalkoxy and the like) group may contain one or more substituents and thus may be "optionally substituted". In addition to the substituents defined above and herein, suitable substituents on the unsaturated carbon atom of an aryl or heteroaryl group also include and are generally selected from -halo, $-NO_2$, $-CN$, $-R^+$, $-C(R^+)=C(R^+)_2$, $-C\equiv C-R^+$, $-OR^+$, $-SR^+$, $-S(O)R^+$, $-SO_2R^+$, $-SO_3R^+$, $-SO_2N(R^+)_2$, $-N(R^+)_2$, $-NR^+C(O)R^+$, $-NR^+C(S)R^+$, $-NR^+C(O)N(R^+)_2$, $-NR^+C(S)N(R^+)_2$, $-N(R^+)C(=NR^+)-N(R^+)_2$, $-N(R^+)C(=NR^+)-R^+$, $-NR^+CO_2R^+$, $-NR^+SO_2R^+$, $-NR^+SO_2N(R^+)_2$, $-O-C(O)R^+$, $-O-CO_2R^+$, $-OC(O)N(R^+)_2$, $-C(O)R^+$, $-C(S)R^+$, $-CO_2R^+$, $-C(O)-C(O)R^+$, $-C(O)N(R^+)_2$, $-C(S)N(R^+)_2$, $-C(O)N(R^+)-OR^+$, $-C(O)N(R^+)C(=NR^+)-N(R^+)_2$, $-N(R^+)C(=NR^+)-N(R^+)-C(O)R^+$, $-C(=NR^+)-N(R^+)_2$, $-C(=NR^+)-OR^+$, $-N(R^+)-N(R^+)_2$, $-C(=NR^+)-N(R^+)-OR^+$, $-C(R^+=N)-OR^+$, $-P(O)(R^+)_2$, $-P(O)(OR^+)_2$, $-O-P(O)-OR^+$, and $-P(O)(NR^+)-N(R^+)_2$, wherein R^+ , independently, is hydrogen or an optionally substituted aliphatic, aryl, heteroaryl, cycloaliphatic, or heterocyclyl group, or two independent occurrences of R^+ are taken together with their intervening atom(s) to form an optionally substituted 5-7-membered aryl, heteroaryl, cycloaliphatic, or heterocyclyl ring. Each R^+ is an optionally substituted aliphatic, aryl, heteroaryl, cycloaliphatic, or heterocyclyl group.

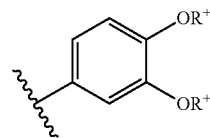
An aliphatic or heteroaliphatic group, or a non-aromatic carbocyclic or heterocyclic ring may contain one or more substituents and thus may be "optionally substituted". Unless otherwise defined above and herein, suitable substituents on the saturated carbon of an aliphatic or heteroaliphatic group, or of a non-aromatic carbocyclic or heterocyclic ring are selected from those listed above for the unsaturated carbon of an aryl or heteroaryl group and additionally include the following: $=O$, $=S$, $=C(R^+)_2$, $=N-N(R^+)_2$, $=N-OR^+$, $=N-NHC(O)R^+$, $=N-NHCO_2R^+$, $=N-NHSO_2R^+$ or $=N-R^+$ where R^+ is defined above, and each R^+ is independently selected from hydrogen or an optionally substituted C_{1-6} aliphatic group.

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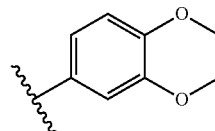
In addition to the substituents defined above and herein, optional substituents on the nitrogen of a non-aromatic heterocyclic ring also include and are generally selected from $-R^+$, $-N(R^+)_2$, $-C(O)R^+$, $-C(O)OR^+$, $-C(O)C(O)R^+$, $-C(O)CH_2C(O)R^+$, $-S(O)_2R^+$, $-S(O)_2N(R^+)_2$, $-C(S)N(R^+)_2$, $-C(=NH)-N(R^+)_2$, or $-N(R^+)S(O)_2R^+$; wherein each R^+ is defined above. A ring nitrogen atom of a heteroaryl or non-aromatic heterocyclic ring also may be oxidized to form the corresponding N-hydroxy or N-oxide compound. A nonlimiting example of such a heteroaryl having an oxidized ring nitrogen atom is N-oxidopyridyl.

As detailed above, in some embodiments, two independent occurrences of R^+ (or any other variable similarly defined in the specification and claims herein), are taken together with their intervening atom(s) to form a monocyclic or bicyclic ring selected from 3-13-membered cycloaliphatic, 3-12-membered heterocyclyl having 1-5 heteroatoms independently selected from nitrogen, oxygen, or sulfur, 6-10-membered aryl, or 5-10-membered heteroaryl having 1-5 heteroatoms independently selected from nitrogen, oxygen, or sulfur.

Exemplary rings that are formed when two independent occurrences of R^+ (or any other variable similarly defined in the specification and claims herein), are taken together with their intervening atom(s) include, but are not limited to the following: a) two independent occurrences of R^+ (or any other variable similarly defined in the specification or claims herein) that are bound to the same atom and are taken together with that atom to form a ring, for example, $N(R^+)_2$, where both occurrences of R^+ are taken together with the nitrogen atom to form a piperidin-1-yl, piperazin-1-yl, or morpholin-4-yl group; and b) two independent occurrences of R^+ (or any other variable similarly defined in the specification or claims herein) that are bound to different atoms and are taken together with both of those atoms to form a ring, for example where a phenyl group is substituted with two occurrences of OR^+



these two occurrences of R^+ are taken together with the oxygen atoms to which they are bound to form a fused 6-membered oxygen containing ring:



It will be appreciated that a variety of other rings (e.g., spiro and bridged rings) can be formed when two independent occurrences of R^+ (or any other variable similarly defined in the specification and claims herein) are taken together with their intervening atom(s) and that the examples detailed above are not intended to be limiting.

Unless otherwise stated, structures depicted herein are also meant to include all isomeric (e.g., enantiomeric, diastereomeric, and geometric (or conformational)) forms of the struc-

ture; for example, the R and S configurations for each asymmetric center, (Z) and (E) double bond isomers, and (Z) and (E) conformational isomers. Therefore, single stereochemical isomers as well as enantiomeric, diastereomeric, and geometric (or conformational) mixtures of the present compounds are within the scope of the invention. Unless otherwise stated, all tautomeric forms of the compounds of the invention are within the scope of the invention. Additionally, unless otherwise stated, structures depicted herein are also meant to include compounds that differ only in the presence of one or more isotopically enriched atoms. For example, compounds having the present structures except for the replacement of hydrogen by deuterium or tritium, or the replacement of a carbon by a ¹³C- or ¹⁴C-enriched carbon are within the scope of this invention. Such compounds are useful, for example, as analytical tools or probes in biological assays.

The terms "stereoisomer", "enantiomer", "diastereomer", "epimer", and "chiral center", are used herein in accordance with the meaning each is given in ordinary usage by those of ordinary skill in the art. Thus, stereoisomers are compounds that have the same atomic connectivity, but differ in the spatial arrangement of the atoms. Enantiomers are stereoisomers that have a mirror image relationship, that is, the stereochemical configuration at all corresponding chiral centers is opposite. Diastereomers are stereoisomers having more than one chiral center, which differ from one another in that the stereochemical configuration of at least one, but not all, of the corresponding chiral centers is opposite. Epimers are diastereomers that differ in stereochemical configuration at only one chiral center.

It is to be understood that, when a disclosed compound has at least one chiral center, the present invention encompasses one enantiomer of the compound, substantially free from the corresponding optical isomer, a racemic mixture of both optical isomers of the compound, and mixtures enriched in one enantiomer relative to its corresponding optical isomer. When a mixture is enriched in one enantiomer relative to its optical isomer, the mixture contains, for example, an enantiomeric excess of at least 50%, 75%, 90%, 95%, 99%, or 99.5%.

The enantiomers of the present invention may be resolved by methods known to those skilled in the art, for example by formation of diastereoisomeric salts which may be separated, for example, by crystallization; formation of diastereoisomeric derivatives or complexes which may be separated, for example, by crystallization, gas-liquid or liquid chromatography; selective reaction of one enantiomer with an enantiomer-specific reagent, for example enzymatic esterification; or gas-liquid or liquid chromatography in a chiral environment, for example on a chiral support for example silica with a bound chiral ligand or in the presence of a chiral solvent. Where the desired enantiomer is converted into another chemical entity by one of the separation procedures described above, a further step is required to liberate the desired enantiomeric form. Alternatively, specific enantiomers may be synthesized by asymmetric synthesis using optically active reagents, substrates, catalysts or solvents, or by converting one enantiomer into the other by asymmetric transformation.

When a disclosed compound has at least two chiral centers, the present invention encompasses a diastereomer substantially free of other diastereomers, an enantiomeric pair of diastereomers substantially free of other stereoisomers, mixtures of diastereomers, mixtures of enantiomeric pairs of diastereomers, mixtures of diastereomers in which one diastereomer is enriched relative to the other diastereomer(s), and mixtures of enantiomeric pairs of diastereomers in which one enantiomeric pair of diastereomers is enriched relative to the other stereoisomers. When a mixture is enriched in one diastereomer or enantiomeric pair of diastereomers relative

to the other stereoisomers, the mixture is enriched with the depicted or referenced diastereomer or enantiomeric pair of diastereomers relative to other stereoisomers for the compound, for example, by a molar excess of at least 50%, 75%, 90%, 95%, 99%, or 99.5%.

As used herein, the term "diastereomeric ratio" refers to the ratio between diastereomers which differ in the stereochemical configuration at one chiral center, relative to a second chiral center in the same molecule. By way of example, a chemical structure with two chiral centers provides four possible stereoisomers: R*R, R*S, S*R, and S*S, wherein the asterisk denotes the corresponding chiral center in each stereoisomer. The diastereomeric ratio for such a mixture of stereoisomers is the ratio of one diastereomer and its enantiomer to the other diastereomer and its enantiomer = (R*R + S*S):(R*S + S*R).

One of ordinary skill in the art will recognize that additional stereoisomers are possible when the molecule has more than two chiral centers. For purposes of the present invention, the term "diastereomeric ratio" has identical meaning in reference to compounds with multiple chiral centers as it does in reference to compounds having two chiral centers. Thus, the term "diastereomeric ratio" refers to the ratio of all compounds having R*R or S*S configuration at the specified chiral centers to all compounds having R*S or S*R configuration at the specified chiral centers. For convenience, this ratio is referred to herein as the diastereomeric ratio at the asterisked carbon, relative to the second specified chiral center.

The diastereomeric ratio can be measured by any analytical method suitable for distinguishing between diastereomeric compounds having different relative stereochemical configurations at the specified chiral centers. Such methods include, without limitation, nuclear magnetic resonance (NMR), gas chromatography (GC), and high performance liquid chromatography (HPLC) methods.

The diastereoisomeric pairs may be separated by methods known to those skilled in the art, for example chromatography or crystallization and the individual enantiomers within each pair may be separated as described above. Specific procedures for chromatographically separating diastereomeric pairs of precursors used in the preparation of compounds disclosed herein are provided in the examples herein.

3. Description of Exemplary Compounds

In some embodiments, for compounds of formula (I):
 V_1 is $-C(O)-$, $-C(O)-N(R^{4a})-$, or $-S(O)_2-$;
 V_2 is $-N(R^{4a})-$, $-C(O)-N(R^{4a})-$, $-N(R^{4a})-C(O)-$, $-SO_2-N(R^{4a})-$, $-N(R^{4a})-SO_2-$, $-O-$, or $-S-$;

m is 0-1; and
 n is 0-2.

In some other embodiments, for compounds of formula (I):
 R^3 is unsubstituted or substituted C_{1-6} aliphatic, unsubstituted or substituted 3-10-membered cycloaliphatic, unsubstituted or substituted 4-10-membered heterocyclyl having 1-4 heteroatoms independently selected from nitrogen, oxygen, and sulfur, unsubstituted or substituted 6-10-membered aryl, or unsubstituted or substituted 5-10-membered heteroaryl having 1-4 heteroatoms independently selected from nitrogen, oxygen, and sulfur; wherein R^3 when substituted is substituted with 1-4 independent occurrences of $-R^5$, wherein R^5 is $-R^{5a}$, $-R^{5d}$, $-T_1-R^{5d}$, or $-V_3-L_3-R^{5d}$;

each occurrence of R^{5a} is independently halogen, C_{1-3} aliphatic, $-CN$, $-NO_2$, $-N(R^{5b})_2$, $-OR^{5b}$, $-SR^{5e}$, $-S(O)_2R^{5c}$, $-S(O)R^{5e}-C(O)R^{5b}$, $-C(O)OR^{5b}$, $-C(O)N(R^{5b})_2$, $-S(O)_2N(R^{5b})_2$, $-OC(O)N(R^{5b})_2$, $-N(R^{5e})C(O)R^{5b}$, $-N(R^{5e})SO_2R^{5c}$, $-N(R^{5e})C(O)OR^{5b}$, $-N(R^{5e})C(O)N(R^{5b})_2$, or $-N(R^{5e})SO_2N(R^{5b})_2$, or a C_{1-4} aliphatic substi-

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tuted with R^{5dd} , halogen, $-\text{CN}$, $-\text{NO}_2$, $-\text{N}(\text{R}^{5b})_2$, $-\text{OR}^{5b}$, $-\text{SR}^{5c}$, $-\text{S}(\text{O})_2\text{R}^{5c}$, $-\text{S}(\text{O})\text{R}^{5c}-\text{C}(\text{O})\text{R}^{5b}$, $-\text{C}(\text{O})\text{OR}^{5b}$, $-\text{C}(\text{O})\text{N}(\text{R}^{5b})_2$, $-\text{S}(\text{O})_2\text{N}(\text{R}^{5b})_2$, $-\text{OC}(\text{O})\text{N}(\text{R}^{5b})_2$, $-\text{N}(\text{R}^{5e})\text{C}(\text{O})\text{R}^{5b}$, $-\text{N}(\text{R}^{5e})\text{SO}_2\text{R}^{5c}$, $-\text{N}(\text{R}^{5e})\text{C}(\text{O})\text{OR}^{5b}$, $-\text{N}(\text{R}^{5e})\text{C}(\text{O})\text{N}(\text{R}^{5b})_2$, or $-\text{N}(\text{R}^{5e})\text{SO}_2\text{N}(\text{R}^{5b})_2$;

each occurrence of R^{5b} is independently hydrogen or an optionally substituted group selected from C_{1-6} aliphatic, 3-10-membered cycloaliphatic, 4-10-membered heterocyclyl having 1-4 heteroatoms independently selected from nitrogen, oxygen, and sulfur, 6-10-membered aryl, or 5-10-membered heteroaryl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur; or two occurrences of R^{5b} on the same nitrogen atom can be taken together with the nitrogen atom to which they are bound to form an optionally substituted 4-7-membered heterocyclyl ring having 0-1 additional heteroatoms selected from nitrogen, oxygen, and sulfur;

each occurrence of R^{5c} is independently an optionally substituted group selected from C_{1-6} aliphatic, 3-10-membered cycloaliphatic, 4-10-membered heterocyclyl having 1-4 heteroatoms independently selected from nitrogen, oxygen, and sulfur, 6-10-membered aryl, or 5-10-membered heteroaryl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur;

each occurrence of R^{5d} is an optionally substituted group selected from 6-10-membered aryl, or 5-10-membered heteroaryl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur;

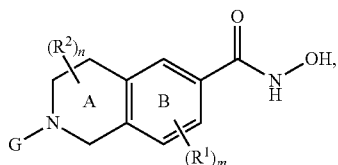
each occurrence of R^{5dd} is an optionally substituted group selected from 6-10-membered aryl, or 5-10-membered heteroaryl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur;

each occurrence of R^{5e} is independently hydrogen or an optionally substituted C_{1-6} aliphatic group;

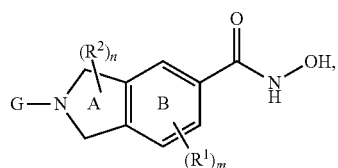
each occurrence of V_3 is independently $-\text{N}(\text{R}^{5e})$, $-\text{O}-$, $-\text{S}-$, $-\text{S}(\text{O})-$, $-\text{S}(\text{O})_2-$, $-\text{C}(\text{O})-$, $-\text{C}(\text{O})\text{O}-$, $-\text{C}(\text{O})\text{N}(\text{R}^{5e})-$, $-\text{S}(\text{O})_2\text{N}(\text{R}^{5e})-$, $-\text{OC}(\text{O})\text{N}(\text{R}^{5e})-$, $-\text{N}(\text{R}^{5e})\text{C}(\text{O})-$, $-\text{N}(\text{R}^{5e})\text{SO}_2-$, $-\text{N}(\text{R}^{5e})\text{C}(\text{O})\text{O}-$, $-\text{N}(\text{R}^{5e})\text{C}(\text{O})\text{N}(\text{R}^{5e})-$, $-\text{N}(\text{R}^{5e})\text{SO}_2\text{N}(\text{R}^{5e})-$, $-\text{OC}(\text{O})-$, or $-\text{C}(\text{O})\text{N}(\text{R}^{5e})\text{O}-$; and

L_3 is an optionally substituted C_{1-3} alkylene chain, where one carbon atom may be replaced with $-\text{CR}^A=\text{CR}^A-$.

In some embodiments, compounds of formula (I) are represented by formulas (II-A)-(II-G):



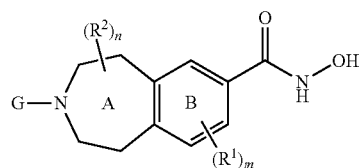
(II-A)



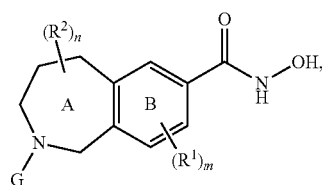
(II-B)

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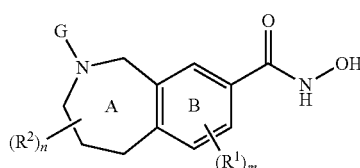
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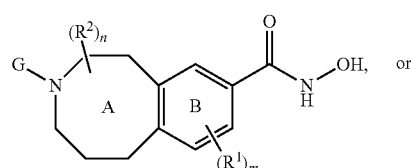
(II-C)



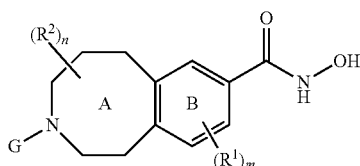
(II-D)



(II-E)



(II-F)

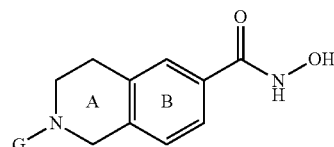


(II-G)

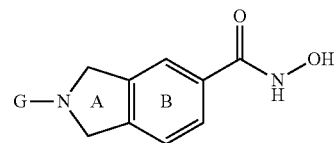
wherein R^1 , R^2 , G , m , and n have the values described herein.

In some embodiments, compounds of formula (I) are represented by formulas (II-A), (II-B), (II-C), (II-D), or (II-E). In some embodiments, compounds of formula (I) are represented by formulas (II-A), (II-B), (II-C), or (II-D). In some embodiments, compounds of formula (I) are represented by formulas (II-A), or (II-B). In some embodiments, compounds of formula (I) are represented by formula (II-A). In some embodiments, compounds of formula (I) are represented by formula (II-C), (II-D), (H-E), (II-F), or (II-G).

In some embodiments, compounds of formula (I) are represented by formulas (III-A)-(III-G):



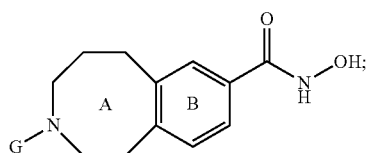
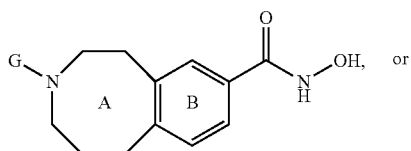
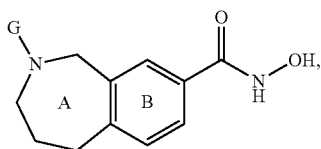
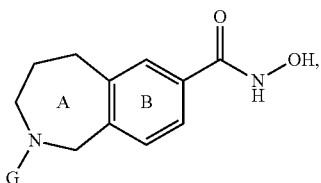
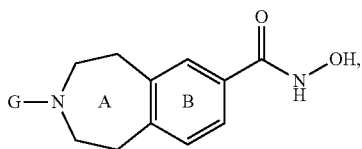
(III-A)



(III-B)

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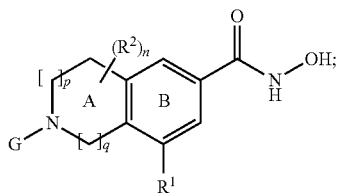
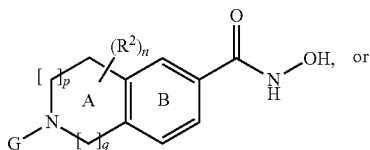
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wherein G has the values described herein.

In some embodiments, compounds of formula (I) are represented by formulas (III-A), (III-B), (III-C), (III-D), or (III-E). In some embodiments, compounds of formula (I) are represented by formulas (III-A), (III-C), or (III-D). In some embodiments, compounds of formula (I) are represented by formulas (III-A), or (III-B). In some embodiments, compounds of formula (I) are represented by formula (III-A). In some embodiments, compounds of formula (I) are represented by formula (III-C), (III-D), (III-E), or (III-G).

In some embodiments, compounds of formula (I) are represented by formulas (IV-A) or (IV-B):

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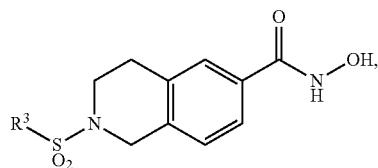
wherein R^1 , R^2 , G, n, p, and q have the values described herein.

In some embodiments, compounds of formula (I) are represented by formula (IV-A).

In some embodiments, compounds of formula (I) are represented by formulas (V-A)-(V-G):

(III-D)

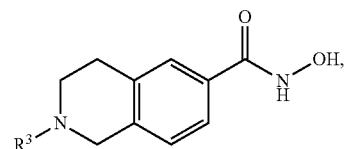
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(V-A)

(III-E)

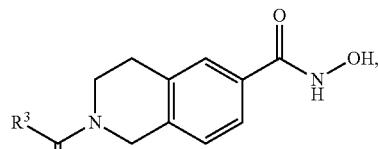
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(V-B)

(III-F)

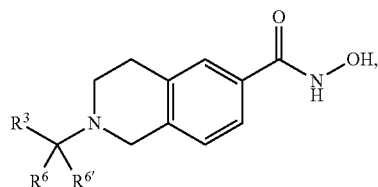
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(V-C)

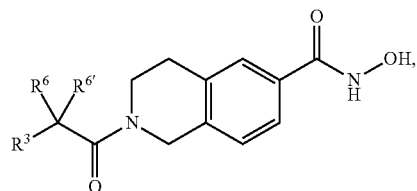
(III-G)

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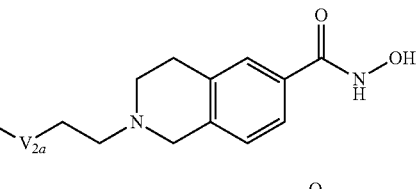
(V-D)

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(V-E)

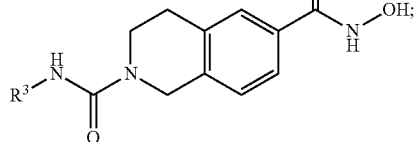
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(V-F)

(IV-A)

50



(V-G)

(IV-B)

55

wherein R^3 , R^6 , $R^{6'}$, and V_{2a} have the values described herein.

The values described below are with respect to any of formulas (I), (II-A)-(II-G), (III-A)-(III-G), (IV-A)-(IV-B), or (V-A)-(V-G).

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In some embodiments:

p is 0-2;

q is 1-4

provided that:

i) the total of p and q is 1-4;

ii) when p is 0, q is not 2.

In some embodiments, p is 0, and q is 1. In some embodiments, p is 0, and q is 3. In some embodiments, p is 0, and q is 4. In some embodiments, p is 1, and q is 1. In some embodiments, p is 1, and q is 2. In some embodiments, p is 1, and q is 3. In some embodiments, p is 2, and q is 1. In some embodiments, p is 2, and q is 2. In certain embodiments, p is 0 and q is 3 or 4; or p is 1 and q is 2 or 3; or p is 2 and q is 1 or 2. In certain embodiments, p is 0 and q is 1; or p is 1 and q is 1. In certain embodiments, p is 1 and q is 1.

In some embodiments, ring B is optionally further substituted with m occurrences of R^1 wherein each occurrence of R^1 is independently halo, C_{1-3} alkyl, C_{1-3} haloalkyl, $-O-C_{1-3}$ alkyl, $-O-C_{1-3}$ haloalkyl, $-CN$, $-NHC(O)C_{1-3}$ alkyl, $-NHC(O)NHC_{1-3}$ alkyl, or $NHS(O)_2C_{1-3}$ alkyl. In certain embodiments, each occurrence of R^1 is independently chloro, fluoro, methoxy, ethoxy, propoxy, cyano, trifluoromethyl, methyl, ethyl, n-propyl, isopropyl, or tert-butyl. In some embodiments, each occurrence of R^1 is independently chloro, fluoro, $-O-C_{1-4}$ alkyl, cyano, hydroxy, C_{1-4} alkyl, or C_{1-4} fluoroalkyl. In certain embodiments, R^1 is chloro, fluoro, cyano, hydroxy, methoxy, ethoxy, trifluoromethoxy, trifluoromethyl, methyl, or ethyl.

In some embodiments, ring A is optionally further substituted with n occurrences of R^2 wherein each occurrence of R^2 is independently halo, C_{1-3} alkyl, C_{1-3} haloalkyl, $-O-C_{1-3}$ alkyl, $-O-C_{1-3}$ haloalkyl, $-NHC(O)C_{1-3}$ alkyl, $-NHC(O)NHC_{1-3}$ alkyl, or $NHS(O)_2C_{1-3}$ alkyl. In certain embodiments, each occurrence of R^2 is independently chloro, fluoro, methoxy, ethoxy, propoxy, trifluoromethyl, methyl, ethyl, n-propyl, isopropyl, or tert-butyl. In some embodiments, each occurrence of R^2 is independently fluoro, C_{1-4} alkyl, or C_{1-4} fluoroalkyl. In certain embodiments, each occurrence of R^2 is independently fluoro, methyl, or trifluoromethyl. In certain embodiments, each occurrence of R^2 is methyl.

In some embodiments, m is 0-2. In some embodiments, m is 0-1. In certain embodiments, m is 0. In certain embodiments, m is 1.

In some embodiments, n is 0-4. In some embodiments, n is 0-2. In certain embodiments, n is 0. In certain embodiments, n is 1. In certain embodiments, n is 2.

In some embodiments, m is 1 and n is 0; or m is 0 and n is 1; or m is 0 and n is 2; or m is 1 and n is 2. In certain embodiments, m is 0 and n is 2; or m is 1 and n is 0.

In some embodiments, the total of m and n must be at least 1. In some embodiments, m is 1 and n is 0; or m is 0 and n is 1; or m is 0 and n is 2; or m is 1 and n is 2. In certain embodiments, m is 0 and n is 2; or m is 1 and n is 0.

In some embodiments, G is $-R^3$, $-V_1-R^3$, $-V_1-L_1-R^3$, $-L_1-V_1-R^3$, $-L_2-V_2-R^3$, $-V_1-L_1-V_2-R^3$, or $-L_1-R^3$, wherein L_1 , L_2 , V_1 , V_2 , and R^3 have the values described herein. In some embodiments, G is $-R^3$, $-C(R^6)(R^6)-R^3$, $-C(O)-R^3$, or $-S(O)_2-R^3$, wherein R^3 , R^6 , and R^6 have the values described herein. In some embodiments, G is $-R^3$, wherein R^3 has the values described herein. In some embodiments, G is $-(CH_2)_t-R^3$, or $-(CH_2)_t-X_3-R^3$, wherein R^3 , X_3 , and t have the values described herein. In some embodiments, G is $-C(O)-R^3$, $-C(R^6)(R^6)-R^3$, $-C(O)-C(R^6)(R^6)-R^3$, $-S(O)_2-R^3$, $-S(O)_2-C(R^6)(R^6)-R^3$, or $-C(O)-NH-R^3$, wherein R^3 , R^6 and R^6 have the values described herein. In some embodiments, G is $-CH_2-CH=CH-R^3$, wherein R^3 has the values described herein.

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In some embodiments, G is $-R^3$, $-V_1-R^3$, $-V_1-L_1-R^3$, $-L_1-V_1-R^3$, $-L_2-V_2-R^3$, $-V_1-L_1-V_2-R^3$, or $-L_1-R^3$, wherein L_1 , L_2 , V_1 , V_2 , and R^3 have the values described herein. In some embodiments, G is $-R^3$, $-V_1-R^3$, or $-L_1-R^3$, wherein L_1 , V_1 , and R^3 have the values described herein.

In certain embodiments, G is $-[C(R^6)(R^6)]_z-R^3$, $-C(O)-[C(R^6)(R^6)]_z-R^3$, $-C(O)-NH-[C(R^6)(R^6)]_z-R^3$, $-S(O)_2-[C(R^6)(R^6)]_z-R^3$, $-[C(R^6)(R^6)]_y-V_{2a}-R^3$, or $-C(O)-C(R^6)(R^6)-V_{2a}-R^3$, wherein R^6 , R^6 , V_{2a} , V_{2a} , R^3 , z, and y have the values described herein. In certain embodiments, G is $-[C(R^6)(R^6)]_z-R^3$, $-C(O)-[C(R^6)(R^6)]_z-R^3$, or $-S(O)_2-[C(R^6)(R^6)]_z-R^3$, wherein R^6 , R^6 , R^3 , and z have the values described herein.

In certain embodiments, G is $-[C(R^6)(R^6)]_z-R^3$, $-[C(R^6)(R^6)]_y-V_{2a}-R^3$, $-S(O)_2-[C(R^6)(R^6)]_y-V_{2a}-R^3$, $-S(O)_2-C(R^6)(R^6)-V_{2a}-R^3$, or $-S(O)_2[C(R^6)(R^6)]_z-R^3$, wherein R^6 , R^6 , V_{2a} , R^3 , z, and y have the values described herein. In certain embodiments, G is $-[C(R^6)(R^6)]_z-R^3$ or $-S(O)_2-[C(R^6)(R^6)]_z-R^3$, wherein R^6 , R^6 , R^3 , and z have the values described herein.

In some embodiments, G is $-C(O)-[C(R^6)(R^6)]_{zz}-R^{3g}$, $-C(O)-N(R^{4a})-[C(R^6)(R^6)]_{zz}-R^{3g}$, $-C(O)-O-[C(R^6)(R^6)]_{zz}-R^{3g}$, $-C(O)-C(R^6)(R^6)-V_{2a}-R^{3g}$, $-C(O)-[C(R^6)(R^6)]_{yy}-V_{2a}-R^{3g}$, $-C(O)-N(R^{4a})-[C(R^6)(R^6)]_{yy}-V_{2a}-R^{3g}$, or $-C(O)-O-[C(R^6)(R^6)]_{yy}-V_{2a}-R^{3g}$, wherein R^6 , R^6 , R^{4a} , V_{2a} , V_{2a} , R^{3g} , zz, and yy have the values described herein. In certain embodiments, G is $-C(O)-[C(R^6)(R^6)]_{zz}-R^{3g}$, $-C(O)-NH-[C(R^6)(R^6)]_{zz}-R^{3g}$, or $-C(O)-[C(R^6)(R^6)]_{yy}-V_{2a}-R^{3g}$, wherein R^6 , R^6 , V_{2a} , V_{2a} , R^{3g} , R^{3g} , zz, and yy have the values described herein. In certain embodiments, G is $-C(O)-[C(R^6)(R^6)]_{zz}-R^{3g}$, $-C(O)-NH-[C(R^6)(R^6)]_{zz}-R^{3g}$, $-C(O)-O-[C(R^6)(R^6)]_{yy}-V_{2a}-R^{3g}$, or $-C(O)-C(R^6)(R^6)-V_{2a}-R^{3g}$, wherein R^6 , R^6 , V_{2a} , V_{2a} , R^{3g} , R^{3g} , zz, and yy have the values described herein. In certain embodiments, G is $-C(O)-C(R^6)(R^6)-R^{3g}$, wherein R^6 , R^6 , and R^{3g} have the values described herein.

In some embodiments, G is $-C(O)-(CH_2)_{zz}-R^{3e}$, $-C(O)-N(R^{4a})-(CH_2)_{zz}-R^{3e}$, $-C(O)-O-(CH_2)_{zz}-R^{3e}$, $-C(O)-CH_2-V_{2a}-R^{3e}$, $-C(O)-O-(CH_2)_{yy}-V_{2a}-R^{3e}$, $-C(O)-N(R^{4a})-(CH_2)_{yy}-V_{2a}-R^{3e}$, or $-C(O)-O-(CH_2)_{yy}-V_{2a}-R^{3e}$, wherein R^{4a} , V_{2a} , V_{2a} , R^{3e} , zz, and yy have the values described herein. In certain embodiments, G is $-C(O)-R^{3e}$, $-C(O)-N(R^{4a})-R^{3e}$, $-C(O)-O-R^{3e}$, $-C(O)-CH_2-R^{3e}$, $-C(O)-N(R^{4a})-CH_2-R^{3e}$, or $-C(O)-O-CH_2-R^{3e}$, wherein R^{4a} and R^{3e} have the values described herein. In certain embodiments, G is $-C(O)-R^{3e}$, $-C(O)-NH-R^{3e}$, $-C(O)-O-R^{3e}$, $-C(O)-CH_2-R^{3e}$, $-C(O)-NH-CH_2-R^{3e}$, or $-C(O)-O-CH_2-R^{3e}$, wherein R^{3e} has the values described herein. In certain embodiments, G is $-C(O)-R^{3e}$ or $-C(O)-CH_2-R^{3e}$, wherein R^{3e} has the values described herein.

In some embodiments, G is $-C(O)-(CH_2)_{zz}-R^{3f}$, $-C(O)-N(R^{4a})-(CH_2)_{zz}-R^{3f}$, $-C(O)-O-(CH_2)_{zz}-R^{3f}$, $-C(O)-CH_2-V_{2a}-R^{3f}$, $-C(O)-O-(CH_2)_{yy}-V_{2a}-R^{3f}$, $-C(O)-N(R^{4a})-(CH_2)_{yy}-V_{2a}-R^{3f}$, or $-C(O)-O-(CH_2)_{yy}-V_{2a}-R^{3f}$, wherein R^{4a} , V_{2a} , V_{2a} , R^{3f} , zz, and yy have the values described herein. In certain embodiments, G is $-C(O)-R^{3f}$, $-C(O)-N(R^{4a})-R^{3f}$, $-C(O)-O-R^{3f}$, $-C(O)-CH_2-R^{3f}$, $-C(O)-N(R^{4a})-CH_2-R^{3f}$, or $-C(O)-O-CH_2-R^{3f}$, wherein R^{4a} and R^{3f} have the values described herein. In certain embodiments, G is $-C(O)-R^{3f}$, $-C(O)-NH-R^{3f}$, $-C(O)-O-R^{3f}$, $-C(O)-CH_2-R^{3f}$, $-C(O)-NH-CH_2-R^{3f}$, or $-C(O)-O-CH_2-R^{3f}$, wherein R^{3f} has the values described herein. In certain embodiments, G is $-C(O)-R^{3f}$ or $-C(O)-CH_2-R^{3f}$, wherein R^{3f} has the values described herein.

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In some embodiments, G is $-\text{C}(\text{O})-(\text{CH}_2)_{zz}-\text{R}^{3h}$, $-\text{C}(\text{O})-\text{N}(\text{R}^{4a})-(\text{CH}_2)_{zz}-\text{R}^{3h}$, $-\text{C}(\text{O})-\text{O}-(\text{CH}_2)_{zz}-\text{R}^{3h}$, $-\text{C}(\text{O})-\text{CH}_2-\text{V}_{2a'}-\text{R}^{3f}$, $-\text{C}(\text{O})-(\text{CH}_2)_{yy}-\text{V}_{2a}-\text{R}^{3h}$, $-\text{C}(\text{O})-\text{N}(\text{R}^{4a})-(\text{CH}_2)_{yy}-\text{V}_{2a}-\text{R}^{3h}$, or $-\text{C}(\text{O})-\text{O}-(\text{CH}_2)_{yy}-\text{V}_{2a}-\text{R}^{3h}$, wherein R^{4a} , V_{2a} , $\text{V}_{2a'}$, R^{3h} , zz , and yy have the values described herein. In certain embodiments, G is $-\text{C}(\text{O})-\text{R}^{3h}$, $-\text{C}(\text{O})-\text{NH}-\text{R}^{3h}$, $-\text{C}(\text{O})-\text{O}-\text{R}^{3h}$, $-\text{C}(\text{O})-\text{CH}_2-\text{R}^{3h}$, $-\text{C}(\text{O})-\text{NH}-\text{CH}_2-\text{R}^{3h}$, or $-\text{C}(\text{O})-\text{O}-\text{CH}_2-\text{R}^{3h}$, wherein R^{3h} has the values described herein. In certain embodiments, G is $-\text{C}(\text{O})-\text{R}^{3h}$, or $-\text{C}(\text{O})-\text{CH}_2-\text{R}^{3h}$, wherein R^{3h} has the values described herein.

In some embodiments, L_1 and L_2 are each independently unsubstituted or substituted C_{1-3} alkylene chain, where one carbon atom may be replaced with $-\text{CR}^A=\text{CR}^A-$. In some 15 embodiments, L_1 and L_2 are each independently $-\text{CH}_2-$, CH_2CH_2- , $-\text{CH}_2\text{CH}_2\text{CH}_2-$, or $-\text{CH}=\text{CH}-$. In some embodiments, L_1 and L_2 are each independently $-\text{CH}_2-$. In some embodiments, L_1 and L_2 are each independently a C_{1-3} 20 alkylene chain, where one carbon atom may be replaced with $-\text{CR}^A=\text{CR}^A-$, optionally substituted with 0-2 occurrences of R^{8a} wherein each occurrence of R^{8a} is independently halogen, C_{1-4} aliphatic, $-\text{CN}$, $-\text{NO}_2$, $-\text{N}(\text{R}^{5b})_2$, $-\text{OR}^{5b}$, $-\text{SR}^{5c}$, $-\text{S}(\text{O})_2\text{R}^{5c}$, $-\text{S}(\text{O})\text{R}^{5c}$, $-\text{C}(\text{O})\text{R}^{5b}$, $-\text{C}(\text{O})\text{OR}^{5b}$, $-\text{C}(\text{O})\text{N}(\text{R}^{5b})_2$, $-\text{S}(\text{O})_2\text{N}(\text{R}^{5b})_2$, $-\text{OC}(\text{O})\text{N}(\text{R}^{5b})_2$, $-\text{N}(\text{R}^{5e})\text{C}(\text{O})\text{R}^{5b}$, $-\text{N}(\text{R}^{5e})\text{SO}_2\text{R}^{5c}$, $-\text{N}(\text{R}^{5e})\text{C}(\text{O})\text{OR}^{5b}$, $-\text{N}(\text{R}^{5e})\text{C}(\text{O})\text{N}(\text{R}^{5b})_2$, or $-\text{N}(\text{R}^{5e})\text{SO}_2\text{N}(\text{R}^{5b})_2$, or a C_{1-4} 25 aliphatic substituted with halogen, $-\text{CN}$, $-\text{NO}_2$, $-\text{N}(\text{R}^{5b})_2$, $-\text{OR}^{5b}$, $-\text{SR}^{5c}$, $-\text{S}(\text{O})_2\text{R}^{5c}$, $-\text{S}(\text{O})\text{R}^{5c}$, $-\text{C}(\text{O})\text{R}^{5b}$, $-\text{C}(\text{O})\text{OR}^{5b}$, $-\text{C}(\text{O})\text{N}(\text{R}^{5b})_2$, $-\text{S}(\text{O})_2\text{N}(\text{R}^{5b})_2$, $-\text{OC}(\text{O})\text{N}(\text{R}^{5b})_2$, $-\text{N}(\text{R}^{5e})\text{C}(\text{O})\text{R}^{5b}$, $-\text{N}(\text{R}^{5e})\text{SO}_2\text{R}^{5c}$, $-\text{N}(\text{R}^{5e})\text{C}(\text{O})\text{OR}^{5b}$, $-\text{N}(\text{R}^{5e})\text{C}(\text{O})\text{N}(\text{R}^{5b})_2$, or $-\text{N}(\text{R}^{5e})\text{SO}_2\text{N}(\text{R}^{5b})_2$. In some embodiments, L_1 and L_2 are each independently a C_{1-3} 30 alkylene chain, where one carbon atom may be replaced with $-\text{CR}^A=\text{CR}^A-$, optionally substituted with 0-2 occurrences of R^{8a} wherein each occurrence of R^{8a} is independently fluoro or C_{1-4} aliphatic.

In some embodiments, L_2 is unsubstituted or substituted C_{2-3} alkylene chain, where one carbon atom may be replaced with $-\text{CR}^A=\text{CR}^A-$. In some embodiments, L_2 is 40 $-\text{CH}_2\text{CH}_2-$ or $-\text{CH}_2\text{CH}_2\text{CH}_2-$. In certain embodiments, L_2 is $-\text{CH}_2\text{CH}_2\text{CH}_2-$. In certain embodiments, L_2 is $-\text{CH}_2\text{CH}_2\text{CH}_2-$.

In some embodiments, V_1 is $-\text{C}(\text{O})-$, $-\text{C}(\text{S})-$, $-\text{C}(\text{O})-\text{N}(\text{R}^{4a})-$, $-\text{C}(\text{O})-\text{O}-$, or $-\text{S}(\text{O})_2-$, wherein R^{4a} has the values described herein. In some embodiments, V_1 is $-\text{C}(\text{O})-$, $-\text{C}(\text{O})-\text{N}(\text{R}^{4a})-$, or $\text{S}(\text{O})_2-$, wherein R^{4a} has the values described herein. In certain embodiments, V_1 is $-\text{C}(\text{O})-$, $-\text{C}(\text{O})-\text{NH}-$, or $\text{S}(\text{O})_2-$. In certain 50 embodiments, V_1 is $-\text{C}(\text{O})-$, or $\text{S}(\text{O})_2-$. In certain embodiments, V_1 is $-\text{C}(\text{S})-$ or $-\text{S}(\text{O})_2-$. In certain embodiments, V_1 is $-\text{S}(\text{O})_2-$.

In some embodiments, the variable V_2 is $-\text{N}(\text{R}^{4a})-$, $-\text{C}(\text{O})-\text{N}(\text{R}^{4a})-$, $-\text{N}(\text{R}^{4a})-\text{C}(\text{O})-$, $-\text{SO}_2-\text{N}(\text{R}^{4a})-$, $-\text{N}(\text{R}^{4a})-\text{SO}_2-$, $-\text{O}-\text{C}(\text{O})-$, $-\text{O}-$, $-\text{S}-$, $-\text{S}(\text{O})-$, $-\text{S}(\text{O})_2-$, $-\text{N}(\text{R}^{4a})-\text{C}(\text{O})-\text{N}(\text{R}^{4a})-$, $-\text{N}(\text{R}^{4a})-\text{C}(\text{O})-\text{O}-$, $-\text{O}-\text{C}(\text{O})-\text{N}(\text{R}^{4a})-$, or $-\text{N}(\text{R}^{4a})-\text{SO}_2-\text{N}(\text{R}^{4a})-$, wherein R^{4a} has the values 55 described herein. In some embodiments, V_2 is $-\text{N}(\text{R}^{4a})-$, $-\text{C}(\text{O})-\text{N}(\text{R}^{4a})-$, $-\text{N}(\text{R}^{4a})-\text{C}(\text{O})-$, $-\text{SO}_2-\text{N}(\text{R}^{4a})-$, $-\text{N}(\text{R}^{4a})-\text{SO}_2-$, $-\text{O}-$, or $-\text{S}-$, wherein R^{4a} has the values described herein. In certain embodiments, V_2 is $-\text{N}(\text{R}^{4a})-$, $-\text{O}-$, or $-\text{S}-$, wherein R^{4a} has the values described herein. In certain embodiments, V_2 is $-\text{NH}-$ or $-\text{O}-$.

In some embodiments, each occurrence of the variable R^A is independently hydrogen, halo, or unsubstituted or substi-

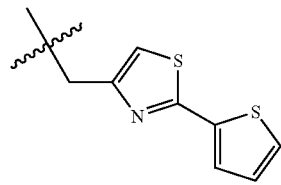
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tuted C_{1-4} aliphatic group. In some embodiments, each occurrence of R^A is independently hydrogen, fluoro, or unsubstituted or substituted C_{1-4} aliphatic. In certain embodiments, each occurrence of R^A is independently hydrogen, fluoro or methyl. In certain embodiments, each occurrence of R^A is hydrogen.

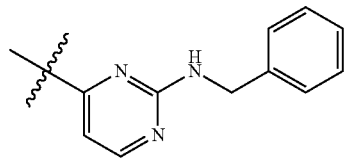
In some embodiments, each occurrence of R^{4a} is independently hydrogen, or unsubstituted or substituted C_{1-4} aliphatic. In certain embodiments, each occurrence of R^{4a} is independently methyl or hydrogen. In certain embodiments, R^{4a} hydrogen.

In some embodiments, G is represented by formulas (VI-a-i)-(VI-j-v):

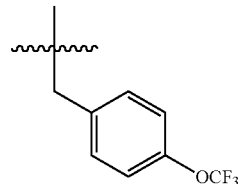
VI-a-i



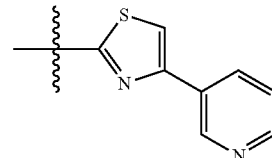
VI-b-i



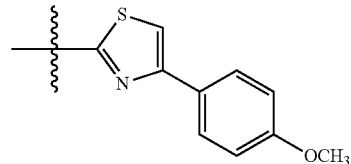
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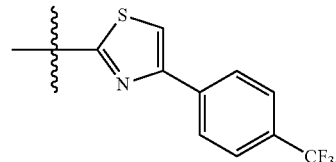
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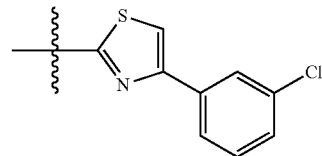
VI-e-i



VI-f-i

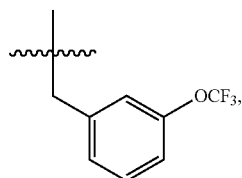
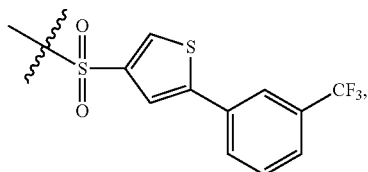
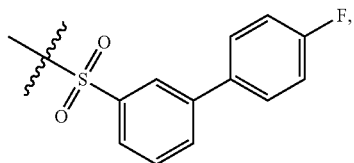
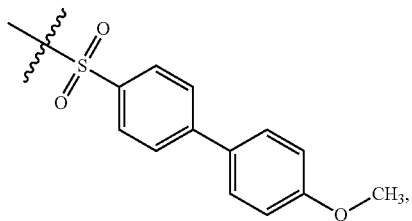
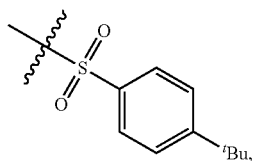
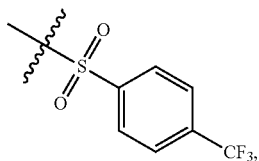
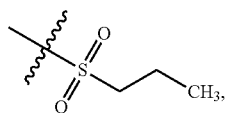
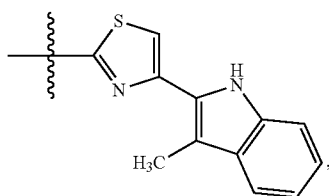


VI-g-i



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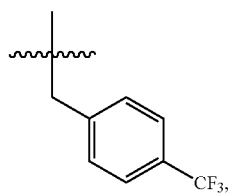
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VI-h-i

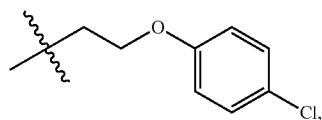
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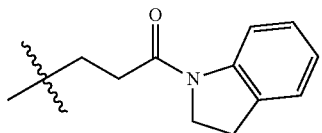
VI-i-i

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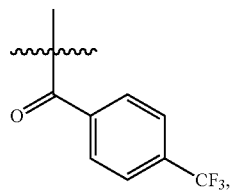
VI-j-i

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VI-k-i

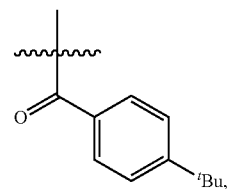
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VI-l-i

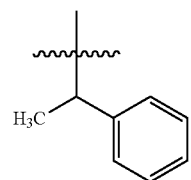
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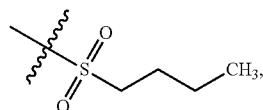
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VI-n-i

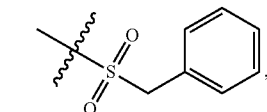
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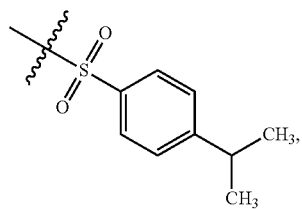
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VI-o-i

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VI-p-i

VI-q-i

VI-r-i

VI-s-i

VI-t-i

VI-u-i

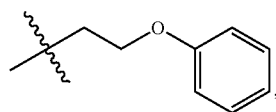
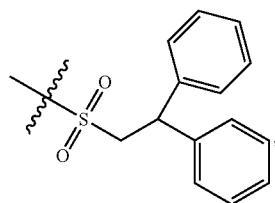
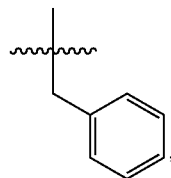
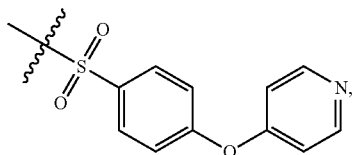
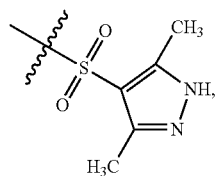
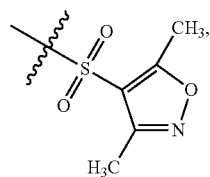
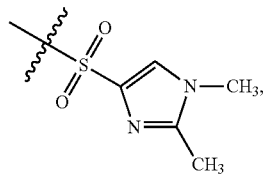
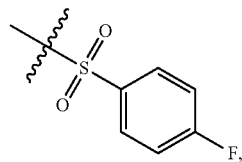
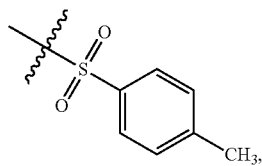
VI-v-i

VI-w-i

VI-x-i

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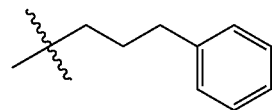
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VI-y-i

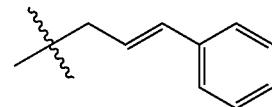
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VI-h-ii

VI-z-i

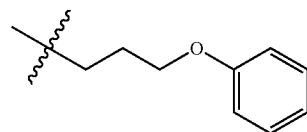
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VI-i-ii

VI-a-ii

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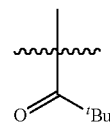


VI-j-ii

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VI-b-ii

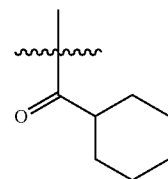
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VI-k-ii

VI-c-ii

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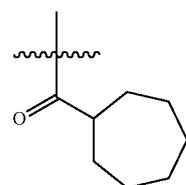


VI-l-ii

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VI-d-ii

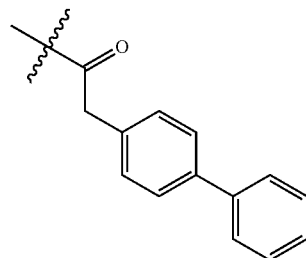
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VI-m-ii

VI-e-ii

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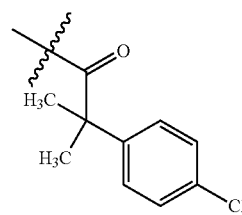


VI-n-ii

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VI-f-ii

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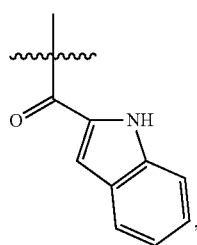
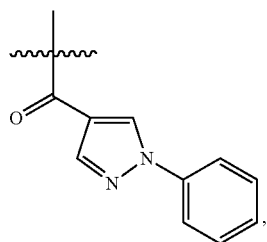
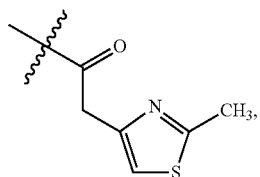
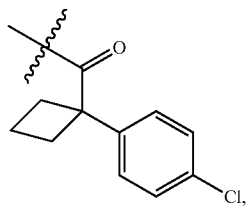
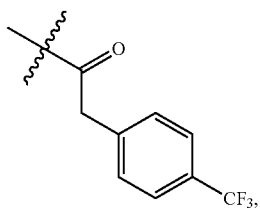
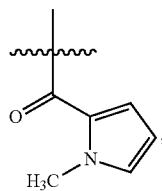
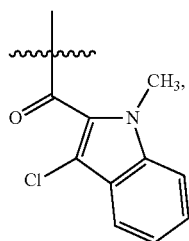
VI-o-ii

VI-g-ii

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31

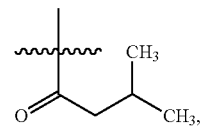
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**32**

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VI-p-ii

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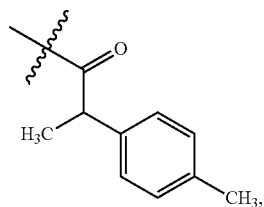


VI-w-i

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VI-q-ii

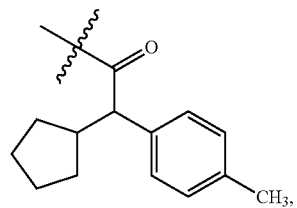
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VI-x-ii

VI-r-ii

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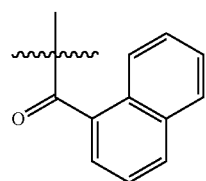


VI-y-ii

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VI-s-ii

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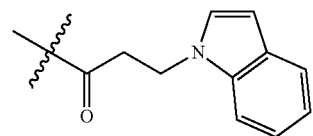


VI-z-ii

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VI-t-ii

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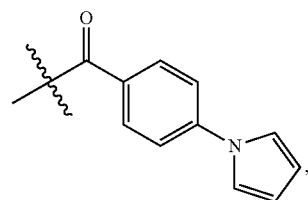


VI-a-iii

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VI-u-ii

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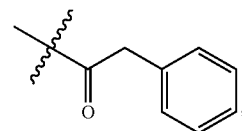


VI-b-iii

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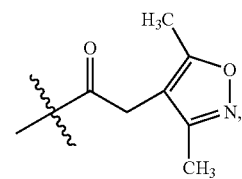
VI-v-ii

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VI-c-iii

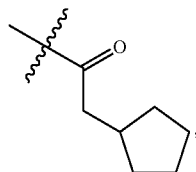
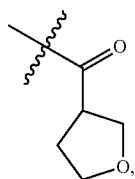
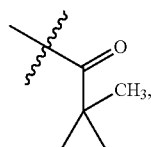
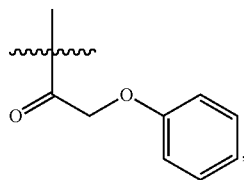
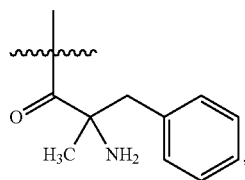
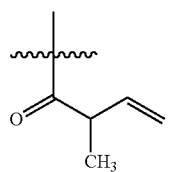
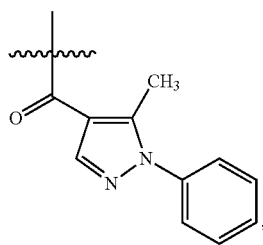
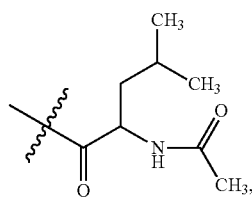
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VI-d-iii

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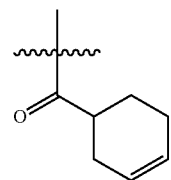
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**34**

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VI-e-iii

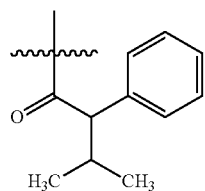
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VI-m-iii

VI-f-iii

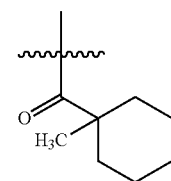
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VI-n-iii

VI-g-iii

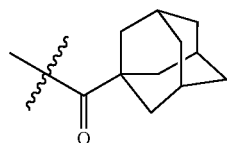
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VI-r-iii

VI-h-iii

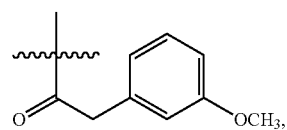
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VI-s-iii

VI-i-iii

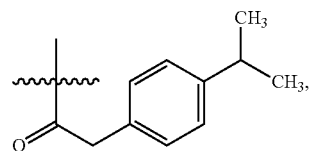
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VI-t-iii

VI-j-iii

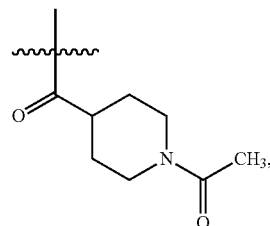
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VI-u-iii

VI-k-iii

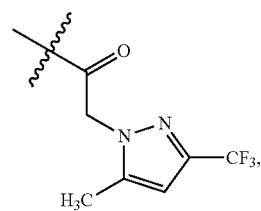
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VI-v-iii

VI-l-iii

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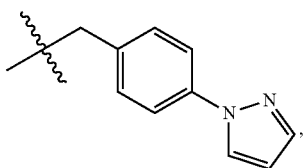
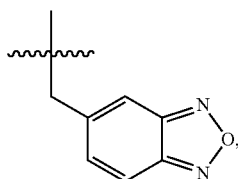
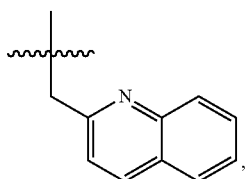
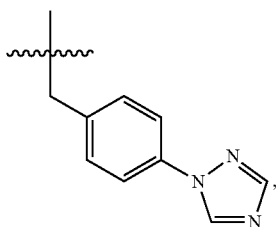
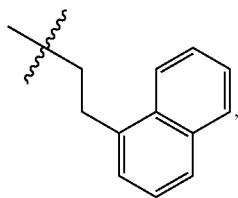
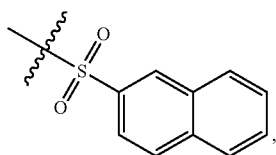
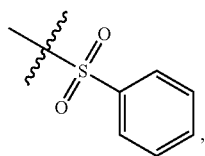
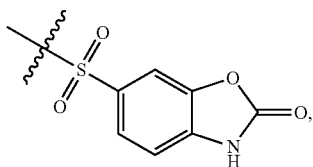


VI-w-iii

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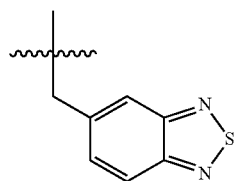
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**36**

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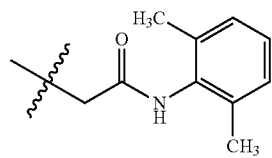
VI-x-iii

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VI-y-iii

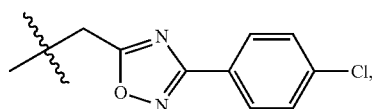
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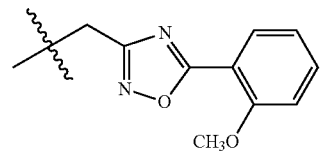
VI-z-iii

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VI-a-iv

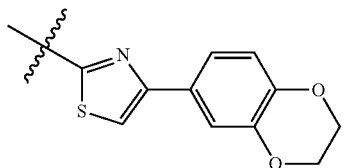
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VI-b-iv

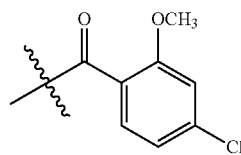
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VI-c-iv

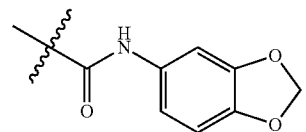
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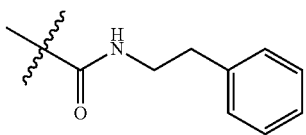
VI-c-iv

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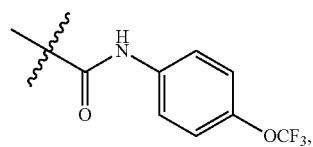


VI-d-iv

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VI-e-iv

VI-f-iv

VI-g-iv

VI-h-iv

VI-i-iv

VI-j-iv

VI-k-iv

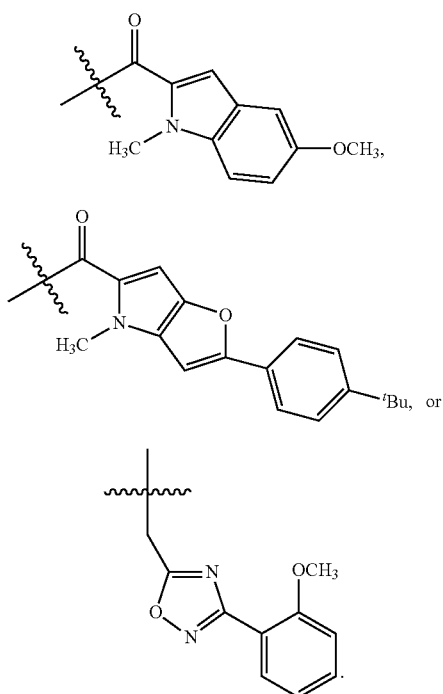
VI-l-iv

VI-m-iv

VI-n-iv

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In some embodiments, R^3 is unsubstituted or substituted C_{1-6} aliphatic, unsubstituted or substituted 3-10-membered cycloaliphatic, unsubstituted or substituted 4-10-membered heterocyclyl having 1-4 heteroatoms independently selected from nitrogen, oxygen, and sulfur, unsubstituted or substituted 6-10-membered aryl, or unsubstituted or substituted 5-10-membered heteroaryl having 1-4 heteroatoms independently selected from nitrogen, oxygen, and sulfur.

In certain embodiments, R^3 is methyl, ethyl, propyl, isopropyl, tert-butyl, butyl, iso-butyl, pentyl, hexyl, butenyl, propenyl, pentenyl, hexenyl, furanyl, thienyl, pyrrolyl, oxazolyl, thiazolyl, imidazolyl, pyrazolyl, isoxazolyl, isothiazolyl, oxadiazolyl, triazolyl, thiadiazolyl, phenyl, naphthyl, pyranlyl, pyridyl, pyridazinyl, pyrimidinyl, pyrazinyl, triazinyl, indolizynyl, imidazopyridyl, indolyl, isoin-
dolyl, indazolyl, benzimidazolyl, benzthiazolyl, benzothienyl, benzofuranyl, benzoxazolyl, benzodioxolyl, benzthiadiazolyl, 2,3-dihydrobenzofuranyl, 4H-furo[3,2-b]pyrrolyl, pyrazolopyrimidinyl, purinyl, quinolyl, isoquinolyl, tetrahydroquinolyl, tetrahydronaphthylidyl, tetrahydroisoquinolyl, cinnolyl, phthalazinyl, quinazolinyl, quinoxalinyl, naphthylidyl, pteridinyl, tetrahydrofuranlyl, tetrahydropyranlyl, tetrahydrothienyl, indanyl, tetrahydroindazolyl, pyrrolidinyl, pyrrolidonyl, piperidinyl, pyrrolinyl, decahydroquinolyl, oxazolidinyl, piperazinyl, dioxanyl, diazepinyl, oxazepinyl, thiazepinyl, morpholinyl, thiomorpholinyl, quinuclidinyl, phenanthridinyl, tetrahydro-
naphthyl, indolyl, benzodioxanyl, chromanyl, cyclopropyl, cyclobutyl, cyclopentyl, cyclohexyl, cycloheptyl, cyclooctyl, cyclopentenyl, cyclohexenyl, cycloheptenyl, cyclooctenyl, bicycloheptanyl, bicyclooctanyl, or adamantyl, wherein each of the foregoing groups are unsubstituted or substituted.

In some embodiments, R^3 unsubstituted or substituted C_{1-6} aliphatic, unsubstituted or substituted 3-10-membered cycloaliphatic, unsubstituted or substituted 4-10-membered heterocyclyl having 1-4 heteroatoms independently selected

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from nitrogen, oxygen, and sulfur, unsubstituted or substituted 6-10-membered aryl, or unsubstituted or substituted 5-10-membered heteroaryl having 1-4 heteroatoms independently selected from nitrogen, oxygen, and sulfur, wherein R^3 if substituted is substituted with 1-4 independent occurrences of $-R^5$, wherein R^5 is $-R^{5a}$, $-R^{5d}$, $-L_3-R^{5d}$, or $-V_3-L_3-R^{5d}$; and R^{5a} , R^{5d} , L_3 , and V_3 have the values described herein.

In certain embodiments, R^3 is methyl, ethyl, propyl, isopropyl, tert-butyl, butyl, iso-butyl, pentyl, hexyl, butenyl, propenyl, pentenyl, hexenyl, furanyl, thienyl, pyrrolyl, oxazolyl, thiazolyl, imidazolyl, pyrazolyl, isoxazolyl, isothiazolyl, oxadiazolyl, triazolyl, thiadiazolyl, phenyl, naphthyl, pyranlyl, pyridyl, pyridazinyl, pyrimidinyl, pyrazinyl, triazinyl, indolizynyl, imidazopyridyl, indolyl, isoin-
dolyl, indazolyl, benzimidazolyl, benzthiazolyl, benzothienyl, benzofuranyl, benzoxazolyl, benzodioxolyl, benzthiadiazolyl, 2,3-dihydrobenzofuranyl, 4H-furo[3,2-b]pyrrolyl, pyrazolopyrimidinyl, purinyl, quinolyl, isoquinolyl, tetrahydroquinolyl, tetrahydronaphthylidyl, tetrahydroisoquinolyl, cinnolyl, phthalazinyl, quinazolinyl, quinoxalinyl, naphthylidyl, pteridinyl, tetrahydrofuranlyl, tetrahydropyranlyl, tetrahydrothienyl, indanyl, tetrahydroindazolyl, pyrrolidinyl, pyrrolidonyl, piperidinyl, pyrrolinyl, decahydroquinolyl, oxazolidinyl, piperazinyl, dioxanyl, diazepinyl, oxazepinyl, thiazepinyl, morpholinyl, thiomorpholinyl, quinuclidinyl, phenanthridinyl, tetrahydro-
naphthyl, indolyl, benzodioxanyl, chromanyl, cyclopropyl, cyclobutyl, cyclopentyl, cyclohexyl, cycloheptyl, cyclooctyl, cyclopentenyl, cyclohexenyl, cycloheptenyl, cyclooctenyl, bicycloheptanyl, bicyclooctanyl, or adamantyl, wherein each of the foregoing groups are unsubstituted or substituted with 1-4 independent occurrences of $-R^5$, wherein R^5 is $-R^{5a}$, $-R^{5d}$, $-L_3-R^{5d}$, or $-V_3-L_3-R^{5d}$; and R^{5a} , R^{5d} , L_3 , and V_3 have the values described herein.

In some embodiments, R^3 is $-R^{3a}$, wherein R^{3a} is unsubstituted or substituted 6-10-membered aryl, or unsubstituted or substituted 5-10-membered heteroaryl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur; wherein R^{3a} if substituted is substituted with 0-1 occurrences of $-R^{5a}$, and one occurrence of $-R^{5d}$.

In some embodiments, R^{3a} is furanyl, thienyl, pyrrolyl, oxazolyl, thiazolyl, imidazolyl, pyrazolyl, isoxazolyl, isothiazolyl, oxadiazolyl, triazolyl, thiadiazolyl, phenyl, naphthyl, pyranlyl, pyridyl, pyridazinyl, pyrimidinyl, pyrazinyl, triazinyl, indolizynyl, indolyl, isoindolyl, indazolyl, benzimidazolyl, benzthiazolyl, benzothienyl, benzofuranyl, benzoxazolyl, benzo[c][1,2,5]oxadiazolyl, benzo[c][1,2,5]thiadiazolyl, benzo[d]oxazol-2(3H)-one, 2,3-dihydrobenzo[b][1,4]dioxinyl, benzo[d][1,3]dioxolyl, 2,3-dihydrobenzofuranyl, 4H-furo[3,2-b]pyrrolyl, purinyl, quinolyl, isoquinolyl, tetrahydroquinolyl, tetrahydroisoquinolyl, cinnolyl, phthalazinyl, quinazolinyl, quinoxalinyl, naphthylidyl, or pteridinyl, wherein each of the foregoing groups are unsubstituted or substituted with 0-1 occurrences of $-R^{5a}$, and substituted with 1 occurrence of $-R^{5d}$, wherein R^{5a} and R^{5d} have the values described herein.

In certain embodiments, R^{3a} is thienyl, thiazolyl, pyrazolyl, oxadiazolyl, 4H-furo[3,2-b]pyrrolyl, or phenyl, wherein each of the foregoing groups are unsubstituted or substituted with 0-1 occurrences of $-R^{5a}$, and substituted with 1 occurrence of $-R^{5d}$, wherein R^{5a} and R^{5d} have the values described herein.

In some embodiments, R^3 is $-R^{3b}$, wherein R^{3b} is unsubstituted or substituted 6-10-membered aryl, or unsubstituted or substituted 5-10-membered heteroaryl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sul-

fur, wherein R^{3b} if substituted is substituted with 0-2 independent occurrences of $-R^{5a}$, wherein R^{5a} has the values described herein. In some embodiments, R^{3b} is furanyl, thienyl, pyrrolyl, oxazolyl, thiazolyl, imidazolyl, pyrazolyl, isoxazolyl, isothiazolyl, oxadiazolyl, triazolyl, thiadiazolyl, phenyl, naphthyl, pyranlyl, pyridyl, pyridazinyl, pyrimidinyl, pyrazinyl, triazinyl, indoliziny, indolyl, isoindolyl, indazolyl, benzimidazolyl, benzthiazolyl, benzothienyl, benzofuranyl, benzoxazolyl, benzo[c][1,2,5]oxadiazolyl, benzo[c][1,2,5]thiadiazolyl, benzo[d]oxazol-2(3H)-one, 2,3-dihydrobenzo[b][1,4]dioxinyl, benzo[d][1,3]dioxolyl, 2,3-dihydrobenzofuranyl, 4H-furo[3,2-b]pyrrolyl, purinyl, quinolyl, isoquinolyl, tetrahydroquinolyl, tetrahydroisoquinolyl, cinnolyl, phthalazinyl, quinazolinyl, quinoxalinyl, naphthyridinyl, or pteridinyl, wherein each of the foregoing groups is unsubstituted or substituted with 0-1 occurrences of $-R^{5a}$, wherein R^{5a} has the values described herein.

In some embodiments, R^3 is $-R^{3c}$, wherein R^{3c} is unsubstituted or substituted 4-10-membered heterocyclyl having 1-4 heteroatoms independently selected from nitrogen, oxygen, and sulfur, unsubstituted or substituted 6-10-membered aryl, or unsubstituted or substituted 5-10-membered heteroaryl having 1-4 heteroatoms independently selected from nitrogen, oxygen, and sulfur, wherein R^{3c} if substituted is substituted with 0-2 independent occurrences of $-R^{5a}$, wherein R^{5a} has the values described herein. In some embodiments, R^{3c} is furanyl, thienyl, pyrrolyl, oxazolyl, thiazolyl, imidazolyl, pyrazolyl, isoxazolyl, isothiazolyl, oxadiazolyl, triazolyl, thiadiazolyl, phenyl, naphthyl, pyranlyl, pyridyl, pyridazinyl, pyrimidinyl, pyrazinyl, triazinyl, indoliziny, indolyl, isoindolyl, indazolyl, benzimidazolyl, benzthiazolyl, benzothienyl, benzofuranyl, benzoxazolyl, benzo[c][1,2,5]oxadiazolyl, benzo[c][1,2,5]thiadiazolyl, benzo[d]oxazol-2(3H)-one, 2,3-dihydrobenzo[b][1,4]dioxinyl, benzo[d][1,3]dioxolyl, 2,3-dihydrobenzofuranyl, 4H-furo[3,2-b]pyrrolyl, purinyl, quinolyl, isoquinolyl, tetrahydroquinolyl, tetrahydroisoquinolyl, cinnolyl, phthalazinyl, quinazolinyl, quinoxalinyl, naphthyridinyl, pteridinyl, tetrahydrofuranlyl, tetrahydrothienyl, pyrrolidinyl, pyrrolidonyl, piperidinyl, pyrrolinyl, decahydroquinolyl, oxazolidinyl, piperazinyl, dioxanyl, dioxolanyl, diazepinyl, oxazepinyl, thiazepinyl, morpholinyl, thiamorpholinyl, quinuclidinyl, indanyl, phenanthridinyl, tetrahydronaphthyl, indolinyl, benzodioxan-yl, benzodioxolyl, or chromanyl, wherein each of the foregoing groups is unsubstituted or substituted with 0-2 independent occurrences of $-R^{5a}$, wherein R^{5a} has the values described herein. In certain embodiments, R^{3c} is phenyl, naphthyl or indolyl, wherein each of the foregoing groups is unsubstituted or substituted with 0-1 independent occurrences of $-R^{5a}$, wherein R^{5a} has the values described herein.

In some embodiments, R^3 is $-R^{3d}$, wherein $-R^{3d}$ is unsubstituted or substituted C_{1-6} aliphatic, unsubstituted or substituted 3-10-membered cycloaliphatic, unsubstituted or substituted 4-10-membered heterocyclyl having 1-4 heteroatoms independently selected from nitrogen, oxygen, and sulfur, unsubstituted or substituted 6-10-membered aryl, or unsubstituted or substituted 5-10-membered heteroaryl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur, wherein R^{3d} if substituted is substituted with 0-2 independent occurrences of $-R^{5a}$, wherein R^{5a} has the values described herein.

In some embodiments, R^{3d} is a C_{1-6} unsubstituted or substituted aliphatic group, wherein R^{3d} if substituted is substituted with 0-1 occurrences of $-R^{5a}$, wherein R^{5a} has the values described herein. In certain embodiments, R^{3d} is

methyl, ethyl, propyl, isopropyl, tert-butyl, butyl, iso-butyl, pentyl, hexyl, butenyl, propenyl, pentenyl, or hexenyl.

In some embodiments, R^{3d} is unsubstituted or substituted 3-10-membered cycloaliphatic, unsubstituted or substituted 4-10-membered heterocyclyl having 1-4 heteroatoms independently selected from nitrogen, oxygen, and sulfur, unsubstituted or substituted 6-10-membered aryl, or unsubstituted or substituted 5-10-membered heteroaryl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur, wherein R^{3d} if substituted is substituted with 0-2 independent occurrences of $-R^{5a}$, wherein R^{5a} has the values described herein. In some embodiments, R^{3d} is furanyl, thienyl, pyrrolyl, oxazolyl, thiazolyl, imidazolyl, pyrazolyl, isoxazolyl, isothiazolyl, oxadiazolyl, triazolyl, thiadiazolyl, phenyl, naphthyl, pyranlyl, pyridyl, pyridazinyl, pyrimidinyl, pyrazinyl, triazinyl, indoliziny, indolyl, isoindolyl, indazolyl, benzimidazolyl, benzthiazolyl, benzothienyl, benzofuranyl, benzoxazolyl, benzo[c][1,2,5]oxadiazolyl, benzo[c][1,2,5]thiadiazolyl, benzo[d]oxazol-2(3H)-one, 2,3-dihydrobenzo[b][1,4]dioxinyl, benzo[d][1,3]dioxolyl, 2,3-dihydrobenzofuranyl, 4H-furo[3,2-b]pyrrolyl, purinyl, quinolyl, isoquinolyl, tetrahydroquinolyl, tetrahydroisoquinolyl, cinnolyl, phthalazinyl, quinazolinyl, quinoxalinyl, naphthyridinyl, pteridinyl, tetrahydrofuranlyl, tetrahydrothienyl, pyrrolidinyl, pyrrolidonyl, piperidinyl, pyrrolinyl, decahydroquinolyl, oxazolidinyl, piperazinyl, dioxanyl, dioxolanyl, diazepinyl, oxazepinyl, thiazepinyl, morpholinyl, thiamorpholinyl, quinuclidinyl, indanyl, phenanthridinyl, tetrahydronaphthyl, indolinyl, benzodioxan-yl, benzodioxolyl, chromanyl, cyclopropyl, cyclobutyl, cyclopentyl, cyclohexyl, cycloheptyl, cyclooctyl, cyclopentenyl, cyclohexenyl, cycloheptenyl, cyclooctenyl, bicycloheptanyl, bicyclooctanyl, or adamantyl, wherein each of the foregoing groups is unsubstituted or substituted with 0-2 independent occurrences of $-R^{5a}$, wherein R^{5a} has the values described herein.

In certain embodiments, R^{3d} is pyrrolyl, thiazolyl, imidazolyl, pyrazolyl, isoxazolyl, isothiazolyl, oxadiazolyl, phenyl, pyridyl, indolyl, benzimidazolyl, benzthiazolyl, benzoxazolyl, benzo[c][1,2,5]oxadiazolyl, benzo[c][1,2,5]thiadiazolyl, benzo[d]oxazol-2(3H)-one, 2,3-dihydrobenzo[b][1,4]dioxinyl, benzo[d][1,3]dioxolyl, 2,3-dihydrobenzofuranyl, purinyl, quinolyl, cinnolyl, naphthyl, piperidinyl, cyclopropyl, cyclopentyl, cyclohexyl, cycloheptyl, cyclohexenyl, or adamantyl, wherein each of the foregoing groups is unsubstituted or substituted with 0-1 occurrences of $-R^{5a}$, wherein R^{5a} has the values described herein.

In some embodiments, the variable R^3 is R^{3g} . In some embodiments, R^{3g} is unsubstituted or substituted C_{1-6} aliphatic, unsubstituted or substituted 3-10-membered cycloaliphatic, unsubstituted or substituted 4-10-membered heterocyclyl having 1-4 heteroatoms independently selected from nitrogen, oxygen, and sulfur, unsubstituted or substituted 6-10-membered aryl, or unsubstituted or substituted 5-10-membered heteroaryl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur.

In some embodiments, R^{3g} is unsubstituted or substituted 6-10-membered aryl, or unsubstituted or substituted 5-10-membered heteroaryl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur, wherein R^{3g} if substituted is substituted with 0-1 occurrences of $-R^{5a}$, and 1 occurrence of $-R^{5d}$, wherein R^{5a} and R^{5d} have the values contained herein. In certain embodiments, R^{3g} is furanyl, thienyl, pyrrolyl, oxazolyl, thiazolyl, imidazolyl, pyrazolyl, isoxazolyl, isothiazolyl, oxadiazolyl, triazolyl, thiadiazolyl, phenyl, naphthyl, pyranlyl, pyridyl, pyridazinyl, pyrimidinyl, pyrazinyl, triazinyl, indoliziny, indolyl, isoindolyl, inda-

zoly, benzimidazolyl, benzthiazolyl, benzothienyl, benzofuranyl, benzoxazolyl, benzo[c][1,2,5]oxadiazolyl, benzo[c][1,2,5]thiadiazolyl, benzo[d]oxazol-2(3H)-one, 2,3-dihydrobenzo[b][1,4]dioxinyl, benzo[d][1,3]dioxolyl, 2,3-dihydrobenzofuranyl, 4H-furo[3,2-b]pyrrolyl, purinyl, quinolyl, isoquinolyl, tetrahydroquinolyl, tetrahydroisoquinolyl, cinnolyl, phthalazinyl, quinazolyl, quinoxalyl, naphthyridinyl, or pteridinyl, wherein each of the foregoing groups is unsubstituted or substituted with 0-1 occurrences of $-R^{5a}$, and substituted with 1 occurrence of $-R^{5d}$, wherein R^{5a} and R^{5d} have the values described herein. In certain embodiments, R^{3g} is thienyl, thiazolyl, pyrazolyl, oxadiazolyl, 4H-furo[3,2-b]pyrrolyl, or phenyl, wherein each of the foregoing groups is unsubstituted or substituted with 0-1 occurrences of $-R^{5a}$, and substituted with 1 occurrence of $-R^{5d}$, wherein R^{5a} and R^{5d} have the values described herein.

In some embodiments, R^{3g} is unsubstituted or substituted C_{1-6} aliphatic, unsubstituted or substituted 3-10-membered cycloaliphatic, unsubstituted or substituted 4-10-membered heterocyclyl having 1-4 heteroatoms independently selected from nitrogen, oxygen, and sulfur, unsubstituted or substituted 6-10-membered aryl, or unsubstituted or substituted 5-10-membered heteroaryl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur, wherein R^{3g} if substituted is substituted with 0-2 independent occurrences of $-R^{5a}$, wherein R^{5a} has the values contained herein. In certain embodiments, R^{3g} is methyl, ethyl, propyl, isopropyl, tert-butyl, butyl, iso-butyl, pentyl, hexyl, butenyl, propenyl, pentenyl, hexenyl, furanyl, thienyl, pyrrolyl, oxazolyl, thiazolyl, imidazolyl, pyrazolyl, isoxazolyl, isothiazolyl, oxadiazolyl, triazolyl, thiadiazolyl, phenyl, naphthyl, pyranyl, pyridyl, pyridazinyl, pyrimidinyl, pyrazinyl, triazinyl, indolizyl, imidazopyridyl, indolyl, isoindolyl, indazolyl, benzimidazolyl, benzthiazolyl, benzothienyl, benzofuranyl, benzoxazolyl, benzodioxolyl, benzthiadiazolyl, 2,3-dihydrobenzofuranyl, 4H-furo[3,2-b]pyrrolyl, pyrazolopyrimidinyl, purinyl, quinolyl, isoquinolyl, tetrahydroquinolyl, tetrahydronaphthyridinyl, tetrahydroisoquinolyl, cinnolyl, phthalazinyl, quinazolyl, quinoxalyl, naphthyridinyl, pteridinyl, tetrahydrofuranlyl, tetrahydropyranlyl, tetrahydrothienyl, indanyl, tetrahydroindazolyl, pyrrolidinyl, pyrrolidonyl, piperidinyl, pyrrolinyl, decahydroquinolyl, oxazolidinyl, piperazinyl, dioxanyl, diazepinyl, oxazepinyl, thiazepinyl, morpholinyl, thiomorpholinyl, quinuclidinyl, phenanthridinyl, tetrahydronaphthyl, indolyl, benzodioxanyl, chromanyl, cyclopropyl, cyclobutyl, cyclopentyl, cyclohexyl, cycloheptyl, cyclooctyl, cyclopentenyl, cyclohexenyl, cycloheptenyl, cyclooctenyl, bicycloheptanyl, bicyclooctanyl, or adamantyl, wherein R^{3g} if substituted is substituted with 0-2 independent occurrences of $-R^{5a}$, wherein R^{5a} has the values described herein. In certain embodiments, R^{3g} is furanyl, thienyl, pyrrolyl, thiazolyl, imidazolyl, pyrazolyl, isoxazolyl, isothiazolyl, oxadiazolyl, phenyl, pyridyl, indolyl, benzimidazolyl, benzthiazolyl, benzoxazolyl, benzo[c][1,2,5]oxadiazolyl, benzo[c][1,2,5]thiadiazolyl, benzo[d]oxazol-2(3H)-one, 2,3-dihydrobenzo[b][1,4]dioxinyl, benzo[d][1,3]dioxolyl, 2,3-dihydrobenzofuranyl, purinyl, quinolyl, cinnolyl, naphthyl, piperidinyl, cyclopropyl, cyclopentyl, cyclohexyl, cycloheptyl, cyclohexenyl, or adamantyl, wherein R^{3g} if substituted is substituted with 0-2 occurrences of $-R^{5a}$, wherein $-R^{5a}$ has the values described herein.

In some embodiments, the variable R^3 is $R^{3g'}$. In some embodiments, $R^{3g'}$ is unsubstituted or substituted 3-10-membered cycloaliphatic, unsubstituted or substituted 4-10-membered heterocyclyl having 1-4 heteroatoms independently

selected from nitrogen, oxygen, and sulfur, unsubstituted or substituted 6-10-membered aryl, or unsubstituted or substituted 5-10-membered heteroaryl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur. In some embodiments, $R^{3g'}$ is unsubstituted or substituted 3-10-membered cycloaliphatic, unsubstituted or substituted 4-10-membered heterocyclyl having 1-4 heteroatoms independently selected from nitrogen, oxygen, and sulfur, unsubstituted or substituted 6-10-membered aryl, or unsubstituted or substituted 5-10-membered heteroaryl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur, wherein $R^{3g'}$ if substituted is substituted with 0-2 occurrences of $-R^{5a}$, wherein R^{5a} has the values described herein.

In certain embodiments, $R^{3g'}$ is furanyl, thienyl, pyrrolyl, oxazolyl, thiazolyl, imidazolyl, pyrazolyl, isoxazolyl, isothiazolyl, oxadiazolyl, triazolyl, thiadiazolyl, phenyl, naphthyl, pyranyl, pyridyl, pyridazinyl, pyrimidinyl, pyrazinyl, triazinyl, indolizyl, imidazopyridyl, indolyl, isoindolyl, indazolyl, benzimidazolyl, benzthiazolyl, benzothienyl, benzofuranyl, benzoxazolyl, benzodioxolyl, benzthiadiazolyl, 2,3-dihydrobenzofuranyl, 4H-furo[3,2-b]pyrrolyl, pyrazolopyrimidinyl, purinyl, quinolyl, isoquinolyl, tetrahydroquinolyl, tetrahydronaphthyridinyl, tetrahydroisoquinolyl, cinnolyl, phthalazinyl, quinazolyl, quinoxalyl, naphthyridinyl, pteridinyl, tetrahydrofuranlyl, tetrahydropyranlyl, tetrahydrothienyl, indanyl, tetrahydroindazolyl, pyrrolidinyl, pyrrolidonyl, piperidinyl, pyrrolinyl, decahydroquinolyl, oxazolidinyl, piperazinyl, dioxanyl, diazepinyl, oxazepinyl, thiazepinyl, morpholinyl, thiomorpholinyl, quinuclidinyl, phenanthridinyl, tetrahydronaphthyl, indolyl, benzodioxanyl, chromanyl, cyclopropyl, cyclobutyl, cyclopentyl, cyclohexyl, cycloheptyl, cyclooctyl, cyclopentenyl, cyclohexenyl, cycloheptenyl, cyclooctenyl, bicycloheptanyl, bicyclooctanyl, or adamantyl, wherein $R^{3g'}$ if substituted is substituted with 0-2 independent occurrences of $-R^{5a}$, wherein R^{5a} has the values described herein. In certain embodiments, $R^{3g'}$ is furanyl, thienyl, pyrrolyl, thiazolyl, imidazolyl, pyrazolyl, isoxazolyl, isothiazolyl, oxadiazolyl, phenyl, pyridyl, indolyl, benzimidazolyl, benzthiazolyl, benzoxazolyl, benzo[c][1,2,5]oxadiazolyl, benzo[c][1,2,5]thiadiazolyl, benzo[d]oxazol-2(3H)-one, 2,3-dihydrobenzo[b][1,4]dioxinyl, benzo[d][1,3]dioxolyl, 2,3-dihydrobenzofuranyl, purinyl, quinolyl, cinnolyl, naphthyl, piperidinyl, cyclopropyl, cyclopentyl, cyclohexyl, cycloheptyl, cyclohexenyl, or adamantyl, wherein $R^{3g'}$ if substituted is substituted with 0-2 occurrences of $-R^{5a}$, wherein R^{5a} has the values described herein.

In some embodiments, the variable R^3 is R^{3e} . In some embodiments, R^{3e} is unsubstituted or substituted 7-10-membered cycloaliphatic, unsubstituted or substituted 7-10-membered heterocyclyl having 1-4 heteroatoms independently selected from nitrogen, oxygen, and sulfur, or unsubstituted or substituted 5-10-membered heteroaryl having 3-5 heteroatoms independently selected from nitrogen, oxygen, or sulfur. In some embodiments, R^{3e} is unsubstituted or substituted 7-10-membered cycloaliphatic, unsubstituted or substituted 7-10-membered heterocyclyl having 1-4 heteroatoms independently selected from nitrogen, oxygen, and sulfur, or unsubstituted or substituted 5-10-membered heteroaryl having 3-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur, wherein R^{3e} if substituted is substituted with 0-1 occurrences of $-R^{5a}$, and 0-1 occurrences of $-R^{5d}$, wherein R^{5a} and R^{5d} have the values contained herein.

In certain embodiments, R^{3e} is triazolyl, thiadiazolyl, oxadiazolyl, benzthiadiazolyl, 2, 3-4H-furo[3,2-b]pyrrolyl, pyrazolopyrimidinyl, purinyl, pteridinyl, quinuclidinyl, diaz-

epinyl, decahydroquinoliny, oxazepinyl, thiazepinyl, oxazepinyl, thiazepinyl, cycloheptyl, cyclooctyl, cycloheptenyl, cyclooctenyl, bicycloheptanyl, bicyclooctanyl, quinuclidinyl, or adamantyl, wherein each of the foregoing groups is unsubstituted or substituted with 0-1 occurrences of $-R^{5a}$, and 0-1 occurrences of $-R^{5d}$, wherein R^{5a} and R^{5d} have the values contained herein.

In some embodiments, R^3 is R^{3f} . In some embodiments, R^{3f} is substituted C_{1-6} aliphatic, substituted 3-6-membered cycloaliphatic, substituted 4-6-membered heterocyclyl having 1-2 heteroatoms independently selected from nitrogen, oxygen, and sulfur, substituted 6-10-membered aryl, or substituted 5-10-membered heteroaryl having 1-2 heteroatoms independently selected from nitrogen, oxygen, and sulfur; wherein R^{3f} is substituted with 1-2 independent occurrences of R^{5aa} , wherein R^{5aa} has the values described herein. In certain embodiments, R^{3f} is methyl, ethyl, propyl, isopropyl, butyl, isobutyl, tert-butyl, hexyl, furanyl, thienyl, pyrrolyl, oxazolyl, thiazolyl, imidazolyl, pyrazolyl, isoxazolyl, isothiazolyl, phenyl, naphthyl, pyranyl, pyridyl, pyridazinyl, pyrimidinyl, pyrazinyl, indoliziny, indazolyl, benzimidazolyl, benzthiazolyl, benzothienyl, benzofuranyl, benzoxazolyl, benzodioxolyl, 2,3-dihydrobenzofuranyl, quinolyl, isoquinolyl, tetrahydroquinolyl, tetrahydronaphthyridinyl, tetrahydroisoquinolyl, cinnolyl, phthalazinyl, quinazolinyl, quinoxalinyl, naphthyridinyl, tetrahydrofuranyl, tetrahydropyranyl, tetrahydrothienyl, indanyl, tetrahydroindazolyl, pyrrolidinyl, pyrrolidonyl, piperidinyl, pyrrolinyl, oxazolidinyl, piperazinyl, dioxanyl, morpholynyl, thiomorpholynyl, tetrahydronaphthyl, indolynyl, benzodioxanyl, chromanyl, cyclopropyl, cyclobutyl, cyclopentyl, cyclohexyl, cyclopentenyl, or cyclohexenyl, wherein each of the foregoing groups is substituted with 1-2 independent occurrences of R^{5aa} ; wherein R^{5aa} has the values described herein.

In some embodiments, R^3 is R^{3h} . In some embodiments, R^{3h} is unsubstituted or substituted C_{1-6} aliphatic, unsubstituted or substituted 3-6-membered cycloaliphatic, unsubstituted or substituted 4-6-membered heterocyclyl having 1-2 heteroatoms independently selected from nitrogen, oxygen, and sulfur, unsubstituted or substituted 6-10-membered aryl, or substituted 5-10-membered heteroaryl having 1-2 heteroatoms independently selected from nitrogen, oxygen, and sulfur; wherein R^{3h} if substituted is substituted with 0-2 independent occurrences of R^{5aaa} , wherein R^{5aaa} has the values described herein. In certain embodiments, R^{3h} is methyl, ethyl, propyl, isopropyl, butyl, isobutyl, tert-butyl, hexyl, furanyl, thienyl, pyrrolyl, oxazolyl, thiazolyl, imidazolyl, pyrazolyl, isoxazolyl, isothiazolyl, phenyl, naphthyl, pyranyl, pyridyl, pyridazinyl, pyrimidinyl, pyrazinyl, indoliziny, indazolyl, benzimidazolyl, benzthiazolyl, benzothienyl, benzofuranyl, benzoxazolyl, benzodioxolyl, 2,3-dihydrobenzofuranyl, quinolyl, isoquinolyl, tetrahydroquinolyl, tetrahydronaphthyridinyl, tetrahydroisoquinolyl, cinnolyl, phthalazinyl, quinazolinyl, quinoxalinyl, naphthyridinyl, tetrahydrofuranyl, tetrahydropyranyl, tetrahydrothienyl, indanyl, tetrahydroindazolyl, pyrrolidinyl, pyrrolidonyl, piperidinyl, pyrrolinyl, oxazolidinyl, piperazinyl, dioxanyl, morpholynyl, thiomorpholynyl, tetrahydronaphthyl, indolynyl, benzodioxanyl, chromanyl, cyclopropyl, cyclobutyl, cyclopentyl, cyclohexyl, cyclopentenyl, or cyclohexenyl, wherein each of the foregoing groups is substituted with 0-2 independent occurrences of R^{5aaa} , wherein R^{5aaa} has the values described herein.

In some embodiments, each occurrence of R^{5a} is independently halogen, C_{1-3} aliphatic, $-\text{CN}$, $-\text{NO}_2$, $-\text{N}(\text{R}^{5b})_2$, $-\text{OR}^{5b}$, $-\text{SR}^{5c}$, $-\text{S}(\text{O})_2\text{R}^{5c}$, $-\text{S}(\text{O})\text{R}^{5c}$, $-\text{C}(\text{O})\text{R}^{5b}$, $-\text{C}(\text{O})\text{OR}^{5b}$, $-\text{C}(\text{O})\text{N}(\text{R}^{5b})_2$, $-\text{S}(\text{O})_2\text{N}(\text{R}^{5b})_2$, $-\text{OC}(\text{O})\text{N}$

$(\text{R}^{5b})_2$, $-\text{N}(\text{R}^{5e})\text{C}(\text{O})\text{R}^{5b}$, $-\text{N}(\text{R}^{5e})\text{SO}_2\text{R}^{5c}$, $-\text{N}(\text{R}^{5e})\text{C}(\text{O})\text{OR}^{5b}$, $-\text{N}(\text{R}^{5e})\text{C}(\text{O})\text{N}(\text{R}^{5b})_2$, or $-\text{N}(\text{R}^{5e})\text{SO}_2\text{N}(\text{R}^{5b})_2$, or a C_{1-4} aliphatic substituted with R^{5dd} , halogen, $-\text{CN}$, $-\text{NO}_2$, $-\text{N}(\text{R}^{5b})_2$, $-\text{OR}^{5b}$, $-\text{SR}^{5c}$, $-\text{S}(\text{O})_2\text{R}^{5c}$, $-\text{S}(\text{O})\text{R}^{5c}$, $-\text{C}(\text{O})\text{R}^{5b}$, $-\text{C}(\text{O})\text{OR}^{5b}$, $-\text{C}(\text{O})\text{N}(\text{R}^{5b})_2$, $-\text{S}(\text{O})_2\text{N}(\text{R}^{5b})_2$, $-\text{OC}(\text{O})\text{N}(\text{R}^{5b})_2$, $-\text{N}(\text{R}^{5e})\text{C}(\text{O})\text{R}^{5b}$, $-\text{N}(\text{R}^{5e})\text{SO}_2\text{R}^{5b}$, $-\text{N}(\text{R}^{5e})\text{C}(\text{O})\text{OR}^{5b}$, $-\text{N}(\text{R}^{5e})\text{C}(\text{O})\text{N}(\text{R}^{5b})_2$, or $-\text{N}(\text{R}^{5e})\text{SO}_2\text{N}(\text{R}^{5b})_2$, wherein R^{5b} , R^{5c} , R^{5dd} , and R^{5e} have the values described herein.

In some embodiments, R^{5a} is halo, C_{1-3} alkyl, C_{1-3} haloalkyl, $-\text{O}-C_{1-3}$ alkyl, $-\text{O}-C_{1-3}$ haloalkyl, $-\text{C}(\text{O})C_{1-3}$ alkyl, $-\text{NHC}(\text{O})C_{1-3}$ alkyl, $-\text{NHC}(\text{O})\text{NHC}_{1-3}$ alkyl, or $\text{NHS}(\text{O})_2C_{1-3}$ alkyl. In some embodiments, R^{5a} is $-\text{CH}_2-\text{R}^{5dd}$, wherein R^{5dd} is phenyl, pyridyl, naphthyl or thienyl optionally substituted with 0-1 occurrence of R^{7a} , wherein R^{7a} has the values described herein. In certain embodiments, R^{5a} is chloro, fluoro, methoxy, ethoxy, propoxy, isopropoxy, trifluoromethyl, trifluoromethoxy, methyl, ethyl, propyl, butyl, isopropyl, $-\text{NHC}(\text{O})\text{CH}_3$, $-\text{NHC}(\text{O})\text{CH}_2\text{CH}_3$, $-\text{NHC}(\text{O})\text{NHCH}_3$, or $-\text{NHS}(\text{O})_2\text{CH}_3$.

In some embodiments, each occurrence of R^{5a} is independently chloro, fluoro, C_{1-4} alkyl, C_{1-6} fluoroalkyl, $-\text{O}-C_{1-6}$ alkyl, $-\text{O}-C_{1-6}$ fluoroalkyl, cyano, hydroxy, $-\text{NHC}(\text{O})C_{1-6}$ alkyl, $-\text{NHC}_{1-6}$ alkyl, $-\text{N}(\text{C}_{1-6}$ alkyl) $_2$, $-\text{C}(\text{O})\text{NHC}_{1-6}$ alkyl, $-\text{C}(\text{O})\text{N}(\text{C}_{1-6}$ alkyl) $_2$, $-\text{NHC}(\text{O})\text{NHC}_{1-6}$ alkyl, $-\text{NHC}(\text{O})\text{N}(\text{C}_{1-6}$ alkyl) $_2$, or $-\text{NHS}(\text{O})_2C_{1-6}$ alkyl. In certain embodiments, each occurrence of R^{5a} is chloro, fluoro, methyl, ethyl, trifluoromethyl, methoxy, ethoxy, trifluoromethoxy, cyano or hydroxy.

In some embodiments, each occurrence of R^{5aa} is independently cyano, hydroxy, C_{1-6} aliphatic substituted with 1-2 occurrences of R^7 or R^8 , C_{1-6} fluoroalkyl, $-\text{O}-C_{1-6}$ fluoroalkyl, $-\text{NHC}(\text{O})C_{1-6}$ alkyl, $-\text{NHC}(\text{O})C_{3-6}$ cycloalkyl, $-\text{C}(\text{O})\text{NHC}_{1-6}$ alkyl, $-\text{NHC}(\text{O})\text{NHC}_{1-6}$ alkyl, $-\text{NHS}(\text{O})_2C_{1-6}$ alkyl, $-\text{NHC}_{1-6}$ alkyl, $-\text{N}(\text{C}_{1-6}$ alkyl) $_2$, or phenyl substituted with 1-2 occurrence of $-\text{R}^7$, wherein R^7 , R^8 and R^{7a} have the values described herein. In certain embodiments, each occurrence of R^{5aa} is independently cyano, hydroxy, trifluoromethyl, trifluoromethoxy, $-\text{NHC}(\text{O})\text{CH}_3$, $-\text{NHC}(\text{O})\text{-cyclopropyl}$, $-\text{C}(\text{O})\text{NHCH}_3$, $-\text{NHC}(\text{O})\text{NHCH}_3$, $-\text{NHS}(\text{O})_2\text{CH}_3$, $-\text{NHCH}_3$, $-\text{N}(\text{CH}_3)_2$, 4-methoxyphenyl, 3-chlorophenyl, 4-chlorophenyl, or 3-methoxyphenyl.

In some embodiments, each occurrence of R^{5aaa} is independently chloro, fluoro, C_{1-4} alkyl, $-\text{O}-C_{1-6}$ alkyl, or phenyl. In certain embodiments, each occurrence of R^{5aaa} is independently chloro, fluoro, methyl, ethyl, propyl, n-butyl, isopropyl, tert-butyl, methoxy, ethoxy, isopropoxy, propoxy, butoxy, tert-butoxy, or phenyl.

In some embodiments, each occurrence of R^7 is independently unsubstituted or substituted 4-10-membered heterocyclyl having 1-4 heteroatoms independently selected from nitrogen, oxygen, and sulfur, unsubstituted or substituted 6-10-membered aryl, or unsubstituted or substituted 5-10-membered heteroaryl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur.

In some embodiments, each occurrence of the variable R^8 is independently chloro, fluoro, $-\text{OH}$, $-\text{O}(\text{C}_{1-6}$ alkyl), $-\text{CN}$, $-\text{N}(\text{C}_{1-6}$ alkyl) $_2$, $-\text{NH}(\text{C}_{1-6}$ alkyl), $-\text{C}(\text{O})\text{N}(\text{C}_{1-6}$ alkyl), $-\text{CO}_2\text{H}$, $-\text{CO}_2(\text{C}_{1-6}$ alkyl), $-\text{C}(\text{O})\text{NH}_2$, or $-\text{C}(\text{O})\text{NH}(\text{C}_{1-6}$ alkyl).

In some embodiments, each occurrence of R^{5b} is independently hydrogen or an optionally substituted group selected from C_{1-6} aliphatic, 3-10-membered cycloaliphatic, 4-10-membered heterocyclyl having 1-4 heteroatoms independently selected from nitrogen, oxygen, and sulfur, 6-10-membered aryl, or 5-10-membered heteroaryl having 1-5 heteroatoms independently selected from nitrogen, oxygen,

and sulfur; or two occurrences of R^{5b} on the same nitrogen atom can be taken together with the nitrogen atom to which they are bound to form an optionally substituted 4-7-membered heterocyclyl ring having 0-1 additional heteroatoms selected from nitrogen, oxygen, and sulfur.

In some embodiments, each occurrence of R^{5c} is independently an optionally substituted group selected from C_{1-6} aliphatic, 3-10-membered cycloaliphatic, 4-10-membered heterocyclyl having 1-4 heteroatoms independently selected from nitrogen, oxygen, and sulfur, 6-10-membered aryl, or 5-10-membered heteroaryl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur.

In some embodiments, each occurrence of R^{5e} is independently hydrogen or an optionally substituted C_{1-6} aliphatic group. In some other embodiments, each occurrence of R^{5e} is independently hydrogen.

In some embodiments, R^6 is hydrogen, C_{1-4} aliphatic, C_{3-6} cycloaliphatic, or 6-10-membered aryl. In some embodiments, R^6 is hydrogen, C_{1-4} aliphatic, or C_{3-6} cycloaliphatic. In certain embodiments, R^6 is hydrogen, methyl, ethyl, phenyl, cyclopropyl, cyclobutyl, or cyclopentyl. In certain embodiments, R^6 is hydrogen or methyl. In certain embodiments, R^6 is hydrogen.

In some embodiments, R^6 is hydrogen, C_{1-4} aliphatic, C_{3-6} cycloaliphatic, or 6-10-membered aryl. In some embodiments, R^6 is hydrogen, C_{1-4} aliphatic, or C_{3-6} cycloaliphatic. In certain embodiments, R^6 is hydrogen, methyl, ethyl, phenyl, cyclopropyl, cyclobutyl, or cyclopentyl. In certain embodiments, R^6 is hydrogen or methyl. In certain embodiments, R^6 is hydrogen.

In some embodiments, R^6 and R^6 are taken together to form a C_{3-6} cycloaliphatic group. In certain embodiments, R^6 and R^6 are taken together to form a cyclopropyl, cyclobutyl, cyclopentyl, or cyclohexyl group.

In some embodiments, at least one of R^6 and R^6 must be $R^{6'}$.

In some embodiments, $R^{6''}$ is C_{1-4} aliphatic, C_{3-6} cycloaliphatic, or 6-10-membered aryl. In some embodiments, $R^{6''}$ is C_{1-4} aliphatic. In certain embodiments, $R^{6''}$ is methyl.

In some embodiments, V_{2a} is $-C(O)-$, $-O-$, $-S-$, $-N(R^{4a})-$, or $-C(O)N(R^{4a})-$. In certain embodiments, V_{2a} is $-NH-$ or $-O-$.

In some embodiments, $V_{2a'}$ is $V_{2a'}$ is $-O-$, $-S-$, or $-N(R^{4e})-$, wherein R^{4a} has the values described herein. In certain embodiments, $V_{2a'}$ is $-O-$ or $-NH-$.

In some embodiments, t is 2-3. In some embodiments, t is 2. In some embodiments, t is 3.

In some embodiments, u is 2-3. In some embodiments, u is 2. In some embodiments, u is 3.

In some embodiments, z is 0-3. In some embodiments, z is 0-1. In certain embodiments, z is 0. In certain embodiments, z is 1. In certain embodiments, z is 2. In certain embodiments, z is 3.

In some embodiments, y is 2-3. In certain embodiments, y is 2. In certain embodiments, y is 3.

In some embodiments, zz is 0-3. In some embodiments, zz is 0-1. In certain embodiments, zz is 0. In certain embodiments, zz is 1. In certain embodiments, zz is 2. In certain embodiments, zz is 3.

In some embodiments, yy is 2-3. In certain embodiments, yy is 2. In certain embodiments, yy is 3.

In some embodiments, V_3 is $-N(R^{5e})-$, $-O-$, $-S-$, $-S(O)-$, $-S(O)_2-$, $-C(O)-$, $-C(O)O-$, $-C(O)N(R^{5e})-$, $-S(O)_2N(R^{5e})-$, $-OC(O)N(R^{5e})-$, $-N(R^{5e})C(O)-$, $-N(R^{5e})SO_2-$, $-N(R^{5e})C(O)O-$, $-N(R^{5e})C(O)N(R^{5e})-$, $-N(R^{5e})SO_2N(R^{5e})-$, $-OC(O)-$, or $-C(O)N(R^{5e})O-$. In some embodiments, V_3 is $-N(R^{5e})-$, $-O-$,

$-S-$, $-C(O)-$, $-C(O)O-$, $-C(O)N(R^{5e})-$, or $-S(O)_2N(R^{5e})-$. In certain embodiments, V_3 is $-NH-$, $-O-$, $-S-$, or $-C(O)-$.

In some embodiments, L_3 is an optionally substituted C_{1-3} alkylene chain, where one carbon atom may be replaced with $-CR^A=CR^A-$. In some embodiments, L_3 is $-CH_2-$, CH_2CH_2- , $-CH_2CH_2CH_2-$, or $-CH=CH-$. In some embodiments, L_3 is $-CH_2-$. In some embodiments, L_3 is a C_{1-3} alkylene chain, where one carbon atom may be replaced with $-CR^A=CR^A-$, optionally substituted with 0-2 occurrences of R^{8a} , wherein each occurrence of R^{8a} is independently halogen, C_{1-4} aliphatic, $-CN$, $-NO_2$, $-N(R^{5b})_2$, $-OR^{5b}$, $-SR^{5c}$, $-S(O)_2R^{5c}$, $-S(O)R^{5c}$, $-C(O)R^{5b}$, $-C(O)OR^{5b}$, $-C(O)N(R^{5b})_2$, $-S(O)_2N(R^{5b})_2$, $-OC(O)N(R^{5b})_2$, $-N(R^{5e})C(O)R^{5b}$, $-N(R^{5e})SO_2R^{5e}$, $-N(R^{5e})C(O)OR^{5b}$, $-N(R^{5e})C(O)N(R^{5b})_2$, or $-N(R^{5e})SO_2N(R^{5b})_2$, or C_{1-4} aliphatic substituted with halogen, $-CN$, $-NO_2$, $-N(R^{5b})_2$, $-OR^{5b}$, $-SR^{5c}$, $-S(O)_2R^{5c}$, $-S(O)R^{5c}$, $-C(O)R^{5b}$, $-C(O)OR^{5b}$, $-C(O)N(R^{5b})_2$, $-S(O)_2N(R^{5b})_2$, $-OC(O)N(R^{5b})_2$, $-N(R^{5e})C(O)R^{5b}$, $-N(R^{5e})SO_2R^{5e}$, $-N(R^{5e})C(O)OR^{5b}$, $-N(R^{5e})C(O)N(R^{5b})_2$, or $-N(R^{5e})SO_2N(R^{5b})_2$, wherein R^{5b} , R^{5c} and R^{5e} have the values described herein. In some embodiments, L_3 is a C_{1-3} alkylene chain, where one carbon atom may be replaced with $-CR^A=CR^A-$, optionally substituted with 0-2 occurrences of R^{8a} , wherein each occurrence of R^{8a} is independently fluoro or C_{1-4} aliphatic.

In some embodiments, R^{5d} is an optionally substituted group selected from 6-10-membered aryl, or 5-10-membered heteroaryl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur. In some embodiments, R^{5d} is an optionally substituted group selected from 6-10-membered aryl, or 5-10-membered heteroaryl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur, wherein R^{5d} if substituted, is substituted with 0-2 independent occurrences of $-R^{7a}$, wherein R^{7a} has the values described herein. In some embodiments, R^{5d} is an optionally substituted group selected from 6-10-membered aryl, or 5-10-membered heteroaryl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur, wherein R^{5d} if substituted is substituted with 0-1 independent occurrences of R^{7a} , wherein R^{7a} has the values described herein.

In some embodiments, R^{5d} is furanyl, thienyl, pyrrolyl, oxazolyl, thiazolyl, imidazolyl, pyrazolyl, isoxazolyl, isothiazolyl, oxadiazolyl, triazolyl, thiadiazolyl, phenyl, naphthyl, pyranlyl, pyridyl, pyridazinyl, pyrimidinyl, pyrazinyl, triazinyl, indolizynyl, indolyl, isoindolyl, indazolyl, benzimidazolyl, benzthiazolyl, benzothienyl, benzofuranyl, benzoxazolyl, benzo[c][1,2,5]oxadiazolyl, benzo[c][1,2,5]thiadiazole, benzo[d]oxazol-2(3H)-one, 2,3-dihydrobenzo[b][1,4]dioxinyl, benzo[d][1,3]dioxolyl, 2,3-dihydrobenzofuranyl, 4H-furo[3,2-b]pyrrolyl, purinyl, quinolyl, isoquinolyl, tetrahydroquinolyl, tetrahydroisoquinolyl, cinnolyl, phthalazinyl, quinazolinyl, quinoxalyl, naphthyridinyl, or pteridinyl, wherein each of the foregoing groups is unsubstituted or substituted with 0-2 independent occurrences of $-R^{7a}$, wherein R^{7a} has the values described herein. In certain embodiments, R^{5d} is thienyl, pyrrolyl, pyrazolyl, isoxazolyl, triazolyl, phenyl, pyridyl, or benzothienyl, wherein each of the foregoing groups is unsubstituted or substituted with 0-1 occurrences of $-R^{7a}$, wherein R^{7a} has the values described herein.

In some embodiments, R^{5dd} is R^{5d} . In certain embodiments, R^{5dd} is phenyl, pyridyl, naphthyl or thienyl optionally substituted with 0-1 occurrence of R^{7a} , wherein R^{7a} has the values described herein.

In some embodiments, R^{7a} is halo, C_{1-3} alkyl, C_{1-3} haloalkyl, $-O-C_{1-3}$ alkyl, $-O-C_{1-3}$ haloalkyl, $-NHC(O)C_{1-3}$ alkyl, $-NHC(O)NHC_{1-3}$ alkyl, or $NHS(O)_2C_{1-3}$ alkyl. In some embodiments, R^{7a} is chloro, fluoro, methoxy, ethoxy,

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propoxy, isopropoxy, trifluoromethyl, trifluoromethoxy, methyl, ethyl, propyl, isopropyl, —NHC(O)CH_3 , $\text{—NHC(O)CH}_2\text{CH}_3$, —NHC(O)NHCH_3 , or $\text{—NHS(O)}_2\text{CH}_3$. In some embodiments, each occurrence of R^{7a} is chloro, fluoro, bromo, iodo, C_{1-6} alkyl, C_{1-6} fluoroalkyl, —O—C_{1-6} alkyl, —O—C_{1-6} fluoroalkyl, cyano, hydroxy, —NHC(O)C_{1-6} alkyl, —NHC_{1-6} alkyl, $\text{—N(C}_{1-6}\text{ alkyl)}_2$, —C(O)NHC_{1-6} alkyl, $\text{—C(O)N(C}_{1-6}\text{ alkyl)}_2$, —NHC(O)NHC_{1-6} alkyl, $\text{—NHC(O)N(C}_{1-6}\text{ alkyl)}_2$, or $\text{—NHS(O)}_2\text{C}_{1-6}$ alkyl. In certain embodiments, R^{7a} is chloro, fluoro, methyl, ethyl, trifluoromethyl, methoxy, ethoxy, trifluoromethoxy, cyano, or hydroxy.

In certain embodiments:

G is —R^3 , $\text{—C(R}^6\text{)(R}^6\text{)—R}^3$, —C(O)—R^3 , or $\text{—S(O)}_2\text{—R}^3$;

R^6 is hydrogen, C_{1-4} aliphatic, C_{3-6} cycloaliphatic, or 6-10-membered aryl;

R^6 is hydrogen, C_{1-4} aliphatic, C_{3-6} cycloaliphatic, or 6-10-membered aryl; or

R^6 and R^6 are taken together to form a C_{3-6} cycloaliphatic group;

R^3 is —R^{3a} ; and

R^{3a} is unsubstituted or substituted 6-10-membered aryl, or unsubstituted or substituted 5-10-membered heteroaryl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur; wherein R^{3a} if substituted is substituted with 0-1 occurrences of —R^{5a} , and one occurrence of —R^{5d} , wherein R^{5a} and R^{5d} have the values described herein.

In certain embodiments:

G is —R^3 ;

R^3 is —R^{3b} ; and

R^{3b} is unsubstituted or substituted 6-10-membered aryl, or unsubstituted or substituted 5-10-membered heteroaryl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur, wherein R^{3b} if substituted is substituted with 0-2 independent occurrences of —R^{5a} ;

wherein R^{5a} has the values described herein.

In certain embodiments:

G is $\text{—(CH}_2\text{)}_t\text{—R}^3$ or $\text{—(CH}_2\text{)}_t\text{—V}_{2a}\text{—R}^3$;

R^3 is —R^{3c} ;

R^{3c} is unsubstituted or substituted 4-10-membered heterocyclyl having 1-4 heteroatoms independently selected from nitrogen, oxygen, and sulfur, unsubstituted or substituted 6-10-membered aryl, or unsubstituted or substituted 5-10-membered heteroaryl having 1-4 heteroatoms independently selected from nitrogen, oxygen, and sulfur, wherein R^{3c} if substituted is substituted with 0-2 independent occurrences of —R^{5a} ;

V_{2a} is —C(O)— , —O— , —S— , $\text{—N(R}^{4a}\text{)—}$, or $\text{—C(O)N(R}^{4a}\text{)—}$; and

t is 2-3;

wherein R^{5a} and R^{4a} have the values described herein.

In certain embodiments:

G is $\text{—C(R}^6\text{)(R}^6\text{)—R}^3$, $\text{—C(O)—[C(R}^6\text{)(R}^6\text{)]}_u\text{—R}^3$, $\text{—S(O)}_2\text{—[C(R}^6\text{)(R}^6\text{)]}_u\text{—R}^3$, or $\text{—C(O)—NH—[C(R}^6\text{)(R}^6\text{)]}_u\text{—R}^3$;

R^6 is hydrogen, C_{1-4} aliphatic, C_{3-6} cycloaliphatic, or 6-10-membered aryl;

R^6 is hydrogen, C_{1-4} aliphatic, C_{3-6} cycloaliphatic, or 6-10-membered aryl; or

R^6 and R^6 are taken together to form a C_{3-6} cycloaliphatic group;

R^3 is —R^{3d} ;

R^{3d} is unsubstituted or substituted C_{1-6} aliphatic, unsubstituted or substituted 3-10-membered cycloaliphatic, unsubstituted or substituted 4-10-membered heterocyclyl having 1-4 heteroatoms independently selected from nitrogen, oxygen, and sulfur, unsubstituted or substituted 6-10-membered aryl, or unsubstituted or substituted 5-10-membered heteroaryl

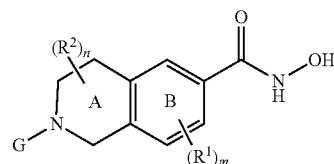
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having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur; wherein R^{3d} if substituted is substituted with 0-2 independent occurrences of —R^{5a} ; and

u is 1-2;

wherein R^{5a} has the values described herein.

In certain embodiments, the compound of formula (I) is represented by formula (II-A):



(II-A)

wherein:

each occurrence of R^1 is independently chloro, fluoro, methoxy, ethoxy, propoxy, cyano, trifluoromethyl, methyl, ethyl, n-propyl, isopropyl, or tert-butyl;

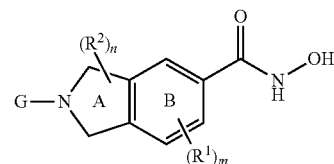
each occurrence of R^2 is independently chloro, fluoro, methoxy, ethoxy, propoxy, trifluoromethyl, methyl, ethyl, n-propyl, isopropyl, or tert-butyl;

m is 0-1; and

n is 0-2;

wherein G has the values described herein.

In some other further embodiments, the compound of formula (I) is represented by formula (II-B).



(II-B)

wherein:

each occurrence of R^1 is independently chloro, fluoro, methoxy, ethoxy, propoxy, cyano, trifluoromethyl, methyl, ethyl, n-propyl, isopropyl, or tert-butyl;

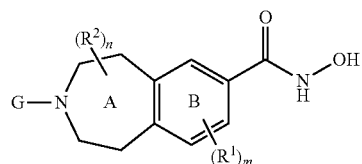
each occurrence of R^2 is independently chloro, fluoro, methoxy, ethoxy, propoxy, trifluoromethyl, methyl, ethyl, n-propyl, isopropyl, or tert-butyl;

m is 0-1; and

n is 0-2;

wherein G has the values described herein.

In certain embodiments, the compound of formula (I) is represented by formula (II-C):



(II-C)

wherein:

each occurrence of R^1 is independently chloro, fluoro, methoxy, ethoxy, propoxy, cyano, trifluoromethyl, methyl, ethyl, n-propyl, isopropyl, or tert-butyl;

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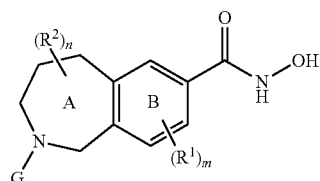
each occurrence of R^2 is independently chloro, fluoro, methoxy, ethoxy, propoxy, trifluoromethyl, methyl, ethyl, n-propyl, isopropyl, or tert-butyl;

m is 0-1; and

n is 0-2;

wherein G has the values described herein.

In certain embodiments, the compound of formula (I) is represented by formula (II-D):



wherein:

each occurrence of R^1 is independently chloro, fluoro, methoxy, ethoxy, propoxy, cyano, trifluoromethyl, methyl, ethyl, n-propyl, isopropyl, or tert-butyl;

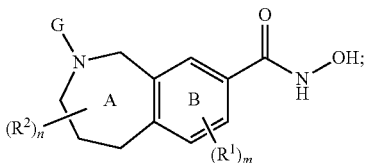
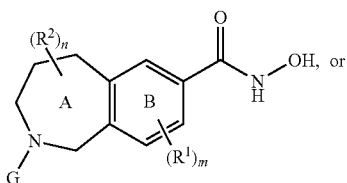
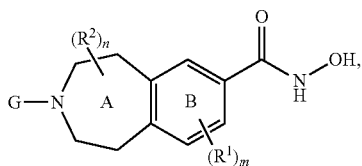
each occurrence of R^2 is independently chloro, fluoro, methoxy, ethoxy, propoxy, trifluoromethyl, methyl, ethyl, n-propyl, isopropyl, or tert-butyl;

m is 0-1; and

n is 0-2;

wherein G has the values described herein.

In certain embodiments, the compound of formula (I) is represented by formulas (II-C)-(II-E):



wherein:

G is $-[C(R^6)(R^6)]_z-R^3$, $-C(O)-[C(R^6)(R^6)]_z-R^3$, $-C(O)-NH-[C(R^6)(R^6)]_z-R^3$, $-S(O)_2-[C(R^6)(R^6)]_z-R^3$, $-[C(R^6)(R^6)]_y-V_{2a}-R^3$, or $-C(O)-C(R^6)(R^6)-V_{2a}-R^3$,

R^6 is hydrogen, C_{1-4} aliphatic, C_{3-6} cycloaliphatic, or 6-10-membered aryl;

$R^{6'}$ is hydrogen, C_{1-4} aliphatic, C_{3-6} cycloaliphatic, or 6-10-membered aryl; or

R^6 and $R^{6'}$ are taken together to form a C_{3-6} cycloaliphatic group;

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V_{2a} is $-C(O)-$, $-O-$, $-S-$, $-N(R^{4a})-$, or $-C(O)N(R^{4a})-$;

R^1 is chloro, fluoro, cyano, hydroxy, methoxy, ethoxy, tri-

fluoromethoxy, trifluoromethyl, methyl, or ethyl;

each occurrence of R^2 is independently fluoro, methyl, or trifluoromethyl;

m is 0-1;

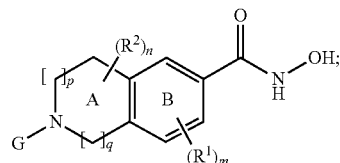
n is 0-2;

y is 2-3; and

z is 0-3;

wherein R^3 and R^{4a} have the values described herein.

In certain embodiments, for the compound of formula (I):



wherein:

p is 0 and q is 1; or p is 1 and q is 1;

G is $-R^3$, $-V_1-R^3$, or $-L_1-R^3$;

V_1 is $-S(O)_2-$;

R^1 is chloro, fluoro, cyano, hydroxy, methoxy, ethoxy, tri-

fluoromethoxy, trifluoromethyl, methyl, or ethyl;

each occurrence of R^2 is independently fluoro, methyl, or trifluoromethyl;

m is 0-1; and

n is 0-2;

wherein L_1 and R^3 have the values described herein.

In certain embodiments described directly above:

G is $-[C(R^6)(R^6)]_z-R^3$, $-[C(R^6)(R^6)]_y-V_{2a}-R^3$,

$-S(O)_2-[C(R^6)(R^6)]_y-V_{2a}-R^3$, or $-S(O)_2-C(R^6)$

$(R^6)-V_{2a}-R^3$, or $-S(O)_2-[C(R^6)(R^6)]_z-R^3$;

R^6 is hydrogen, C_{1-4} aliphatic, C_{3-6} cycloaliphatic, or 6-10-membered aryl; $R^{6'}$ is hydrogen, C_{1-4} aliphatic, C_{3-6} cycloaliphatic, or 6-10-membered aryl; or

R^6 and $R^{6'}$ are taken together to form a C_{3-6} cycloaliphatic group;

V_{2a} is $-O-$ or $-NH-$;

R^1 is chloro, fluoro, cyano, hydroxy, methoxy, ethoxy, tri-

fluoromethoxy, trifluoromethyl, methyl, or ethyl;

each occurrence of R^2 is independently fluoro, methyl, or trifluoromethyl;

m is 0-1;

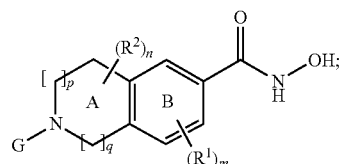
n is 0-2;

y is 2-3; and

z is 0-3;

wherein R^3 has the values described herein.

In certain embodiments, for the compound of formula (I):



wherein:

p is 0 and q is 1; or p is 1 and q is 1;

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G is $-\text{C}(\text{O})-[\text{C}(\text{R}^6)(\text{R}^{6'})]_{zz}-\text{R}^{3g}$, $-\text{C}(\text{O})-\text{NH}-[\text{C}(\text{R}^6)(\text{R}^{6'})]_{zz}-\text{R}^{3g}$, or $-\text{C}(\text{O})-[\text{C}(\text{R}^6)(\text{R}^{6'})]_{yy}-\text{V}_{2a}-\text{R}^{3g}$;
wherein at least one occurrence of R^6 is $\text{R}^{6''}$;

R^1 is chloro, fluoro, cyano, hydroxy, methoxy, ethoxy, trifluoromethoxy, trifluoromethyl, methyl, or ethyl;

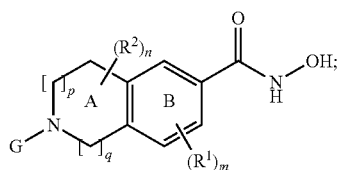
each occurrence of R^2 is independently fluoro, methyl, or trifluoromethyl;

m is 0-1; and

n is 0-2;

wherein R^6 , $\text{R}^{6'}$, R^{3g} , $\text{R}^{3g'}$, V_{2a} , $\text{R}^{6''}$, zz and yy have the values described herein.

In certain embodiments, for the compound of formula (I):



wherein:

p is 0 and q is 1; or p is 1 and q is 1;

G is $-\text{C}(\text{O})-[\text{C}(\text{R}^6)(\text{R}^{6'})]_{zz}-\text{R}^{3g}$, $-\text{C}(\text{O})-\text{NH}-[\text{C}(\text{R}^6)(\text{R}^{6'})]_{zz}-\text{R}^{3g}$, or $-\text{C}(\text{O})-[\text{C}(\text{R}^6)(\text{R}^{6'})]_{yy}-\text{V}_{2a}-\text{R}^{3g}$, or $-\text{C}(\text{O})-\text{C}(\text{R}^6)(\text{R}^{6'})-\text{V}_{2a}-\text{R}^{3g}$;

R^6 is hydrogen or C_{1-4} aliphatic;

$\text{R}^{6'}$ is hydrogen or C_{1-4} aliphatic; or

R^6 and $\text{R}^{6'}$ are taken together to form a C_{3-6} cycloaliphatic group;

$\text{R}^{6''}$ is C_{1-4} aliphatic;

wherein at least one occurrence of R^6 is $\text{R}^{6''}$;

V_{2a} is $-\text{O}-$ or $-\text{NH}-$;

$\text{V}_{2a'}$ is $-\text{O}-$ or $-\text{NH}-$;

R^1 is chloro, fluoro, cyano, hydroxy, methoxy, ethoxy, trifluoromethoxy, trifluoromethyl, methyl, or ethyl;

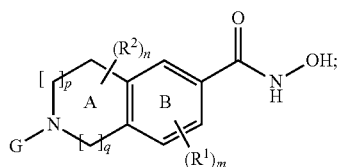
each occurrence of R^2 is independently fluoro, methyl, or trifluoromethyl;

m is 0-1; and

n is 0-2.

wherein R^{3g} , $\text{R}^{3g'}$, zz, and yy have the values described herein.

In certain embodiments, for the compound of formula (I):



wherein:

p is 0 and q is 1; or p is 1 and q is 1;

G is $-\text{C}(\text{O})-\text{R}^{3e}$, $-\text{C}(\text{O})-\text{N}(\text{R}^{4a})-\text{R}^{3e}$, $-\text{C}(\text{O})-\text{O}-\text{R}^{3e}$, $-\text{C}(\text{O})-\text{CH}_2-\text{R}^{3e}$, $-\text{C}(\text{O})-\text{N}(\text{R}^{4a})-\text{CH}_2-\text{R}^{3e}$, or $-\text{C}(\text{O})-\text{O}-\text{CH}_2-\text{R}^{3e}$; and

R^{3e} is triazolyl, thiadiazolyl, benzthiadiazolyl, 2, 3-4H-furo[3,2-b]pyrrolyl, pyrazolopyrimidinyl, purinyl, pteridinyl, quinuclidinyl, cycloheptyl, cyclooctyl, cycloheptenyl, cyclooctenyl, bicycloheptanyl, bicyclooctanyl, or adamantyl;

wherein R^1 , R^2 , m, n, and R^{4a} have the values described herein.

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In certain embodiments described directly above:

R^1 is chloro, fluoro, cyano, hydroxy, methoxy, ethoxy, trifluoromethoxy, trifluoromethyl, methyl, or ethyl;

each occurrence of R^2 is independently fluoro, methyl, or trifluoromethyl;

m is 0-1;

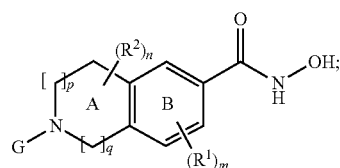
n is 0-2;

p is 1; and

q is 1;

wherein R^{4a} has the values described herein.

In certain embodiments, for the compound of formula (I):



wherein:

p is 0 and q is 1; or p is 1 and q is 1;

G is $-\text{C}(\text{O})-\text{R}^{3f}$, $-\text{C}(\text{O})-\text{N}(\text{R}^{4a})-\text{R}^{3f}$, $-\text{C}(\text{O})-\text{O}-\text{R}^{3f}$, $-\text{C}(\text{O})-\text{CH}_2-\text{R}^{3f}$, $-\text{C}(\text{O})-\text{N}(\text{R}^{4a})-\text{CH}_2-\text{R}^{3f}$, or $-\text{C}(\text{O})-\text{O}-\text{CH}_2-\text{R}^{3f}$.

R^{3f} is substituted C_{1-6} aliphatic, substituted 3-6-membered cycloaliphatic, substituted 4-6-membered heterocyclyl having 1-2 heteroatoms independently selected from nitrogen, oxygen, and sulfur, substituted 6-10-membered aryl, or substituted 5-10-membered heteroaryl having 1-2 heteroatoms independently selected from nitrogen, oxygen, and sulfur; wherein R^{3f} is substituted with 1-2 independent occurrences of R^{5aa} ;

each occurrence of R^{5aa} is independently cyano, hydroxy, trifluoromethyl, trifluoromethoxy, $-\text{NHC}(\text{O})\text{CH}_3$, $-\text{NHC}(\text{O})-\text{cyclopropyl}$, $-\text{C}(\text{O})\text{NHCH}_3$, $-\text{NHC}(\text{O})\text{NHCH}_3$, $-\text{NHS}(\text{O})_2\text{CH}_3$, $-\text{NHCH}_3$, $-\text{N}(\text{CH}_3)_2$, 4-methoxyphenyl, 3-chlorophenyl, 4-chlorophenyl, or 3-methoxyphenyl;

wherein R^1 , R^2 , m, n, and R^{4a} have the values described herein.

In certain embodiments described directly above:

R^1 is chloro, fluoro, cyano, hydroxy, methoxy, ethoxy, trifluoromethoxy, trifluoromethyl, methyl, or ethyl;

each occurrence of R^2 is independently fluoro, methyl, or trifluoromethyl;

m is 0-1;

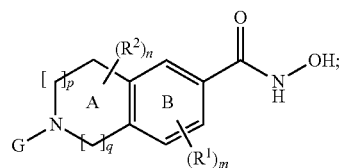
n is 0-2;

p is 1; and

q is 1;

wherein R^{4a} has the values described herein.

In certain embodiments, for the compound of formula (I):



wherein:

p is 0 and q is 1; or p is 1 and q is 1;

the total of m and n must be at least 1;

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G is $-\text{C}(\text{O})-\text{R}^{3h}$, $-\text{C}(\text{O})-\text{N}(\text{R}^{4a})-\text{R}^{3h}$, $-\text{C}(\text{O})-\text{O}-\text{R}^{3h}$, $-\text{C}(\text{O})-\text{CH}_2-\text{R}^{3h}$, $-\text{C}(\text{O})-\text{N}(\text{R}^{4a})-\text{CH}_2-\text{R}^{3h}$, or $-\text{C}(\text{O})-\text{O}-\text{CH}_2-\text{R}^{3h}$;

wherein R^1 , R^2 , R^{4a} , and R^{3h} have the values described herein.

In certain embodiments described directly above:

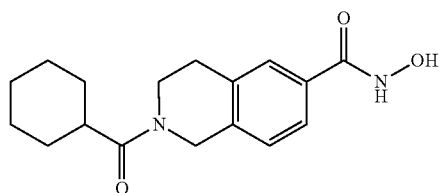
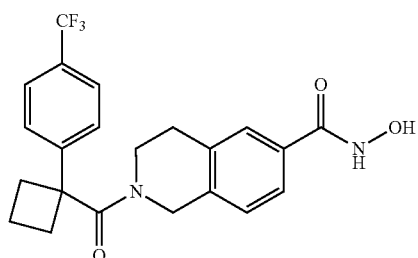
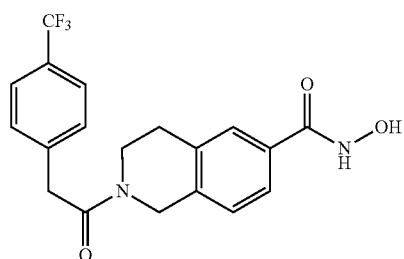
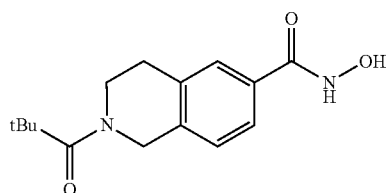
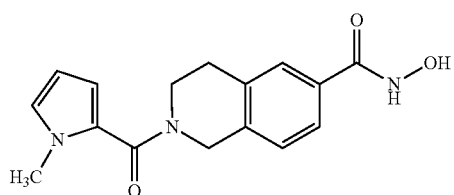
R^1 is chloro, fluoro, cyano, hydroxy, methoxy, ethoxy, trifluoromethoxy, trifluoromethyl, methyl, or ethyl;

each occurrence of R^2 is independently fluoro, methyl, or trifluoromethyl; and

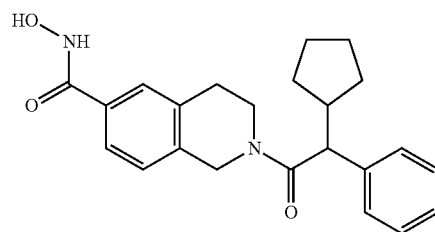
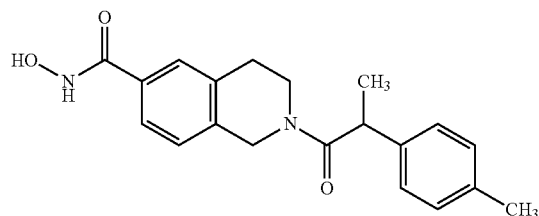
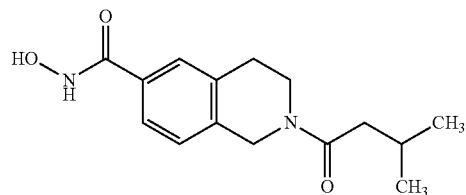
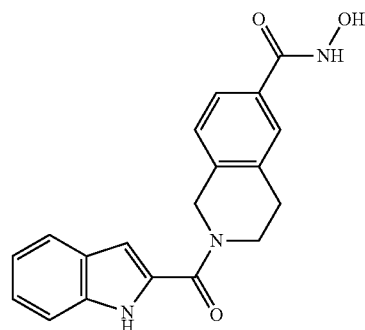
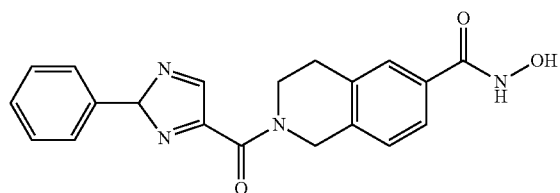
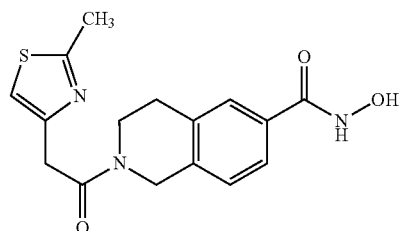
m is 1 and n is 0; or m is 0 and n is 1; or m is 0 and n is 2; or m is 1 and n is 2;

wherein R^{4a} and R^{3h} have the values described herein.

Representative examples of compounds of formula (I) are shown in Table 1:

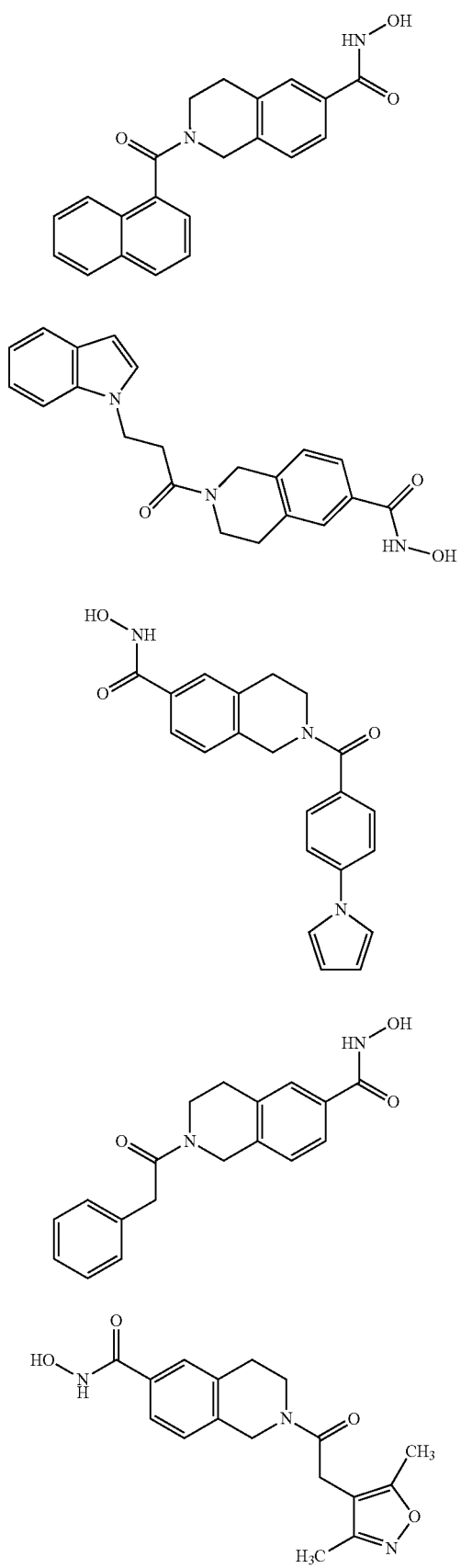
**56**

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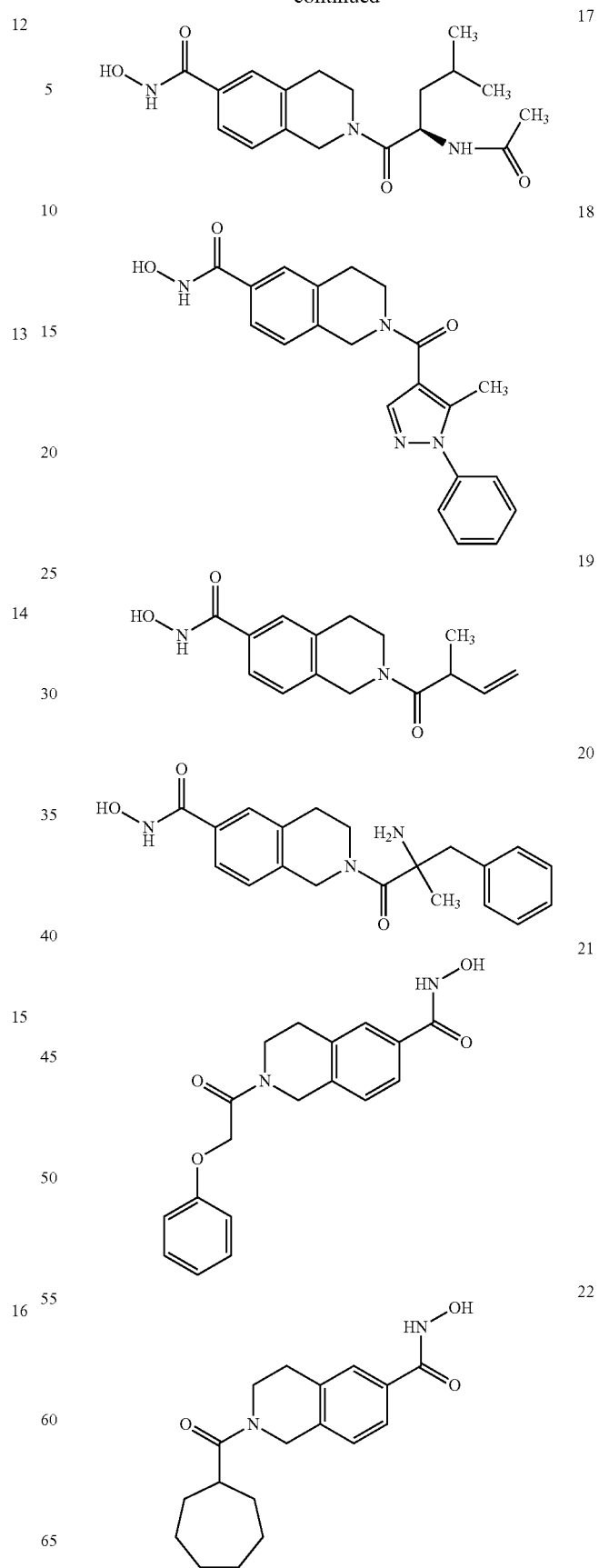


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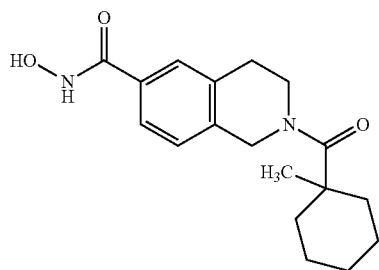
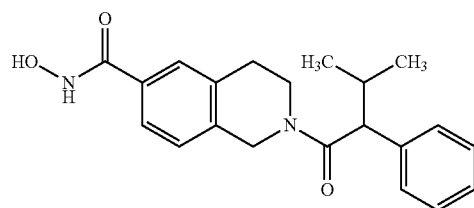
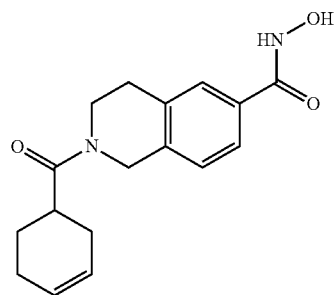
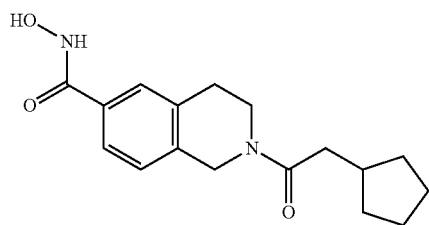
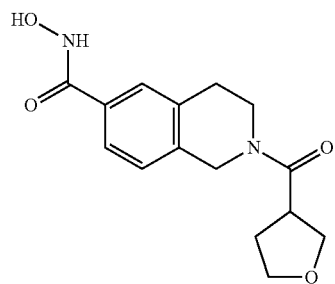
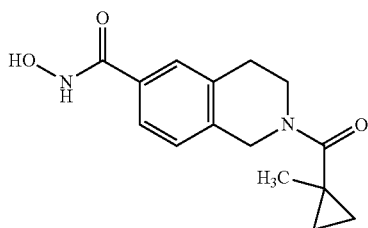
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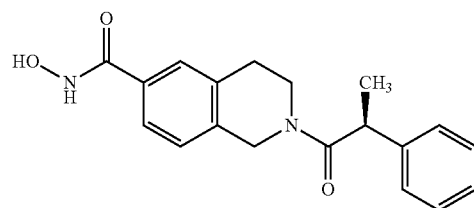


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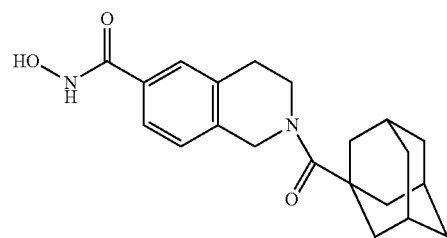
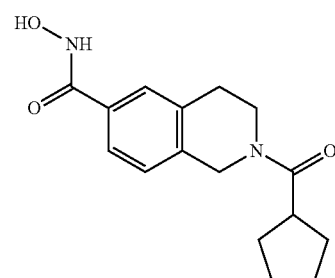
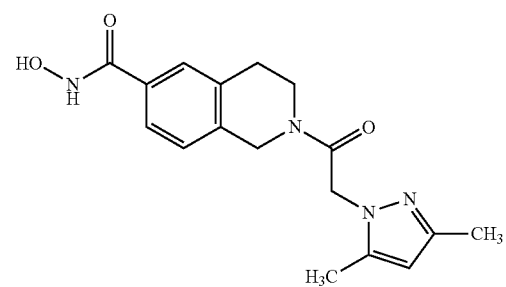
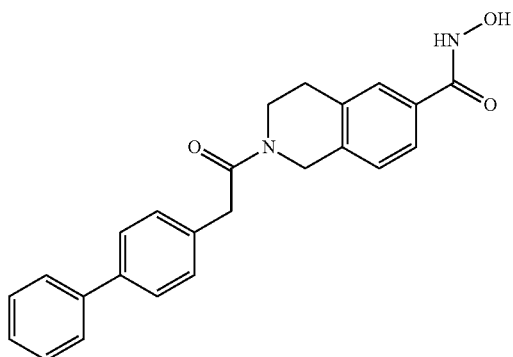
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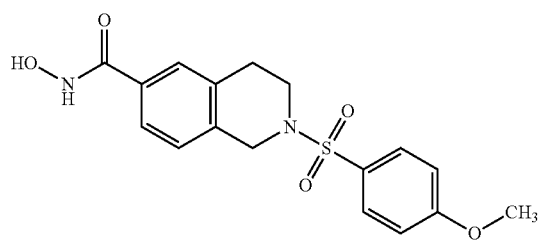
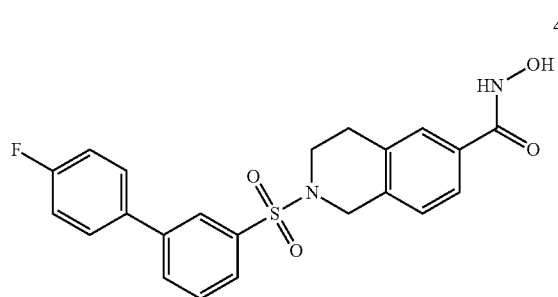
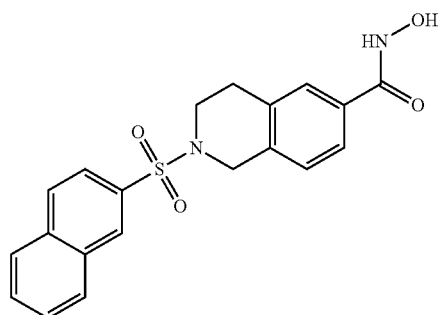
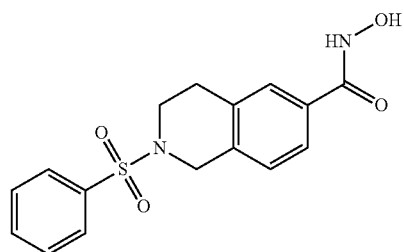
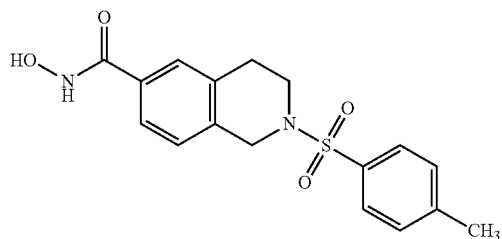
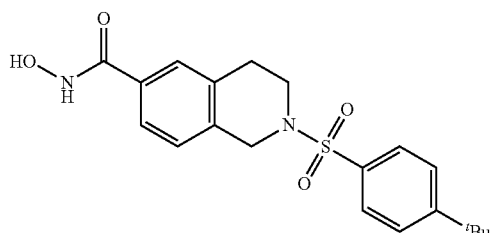
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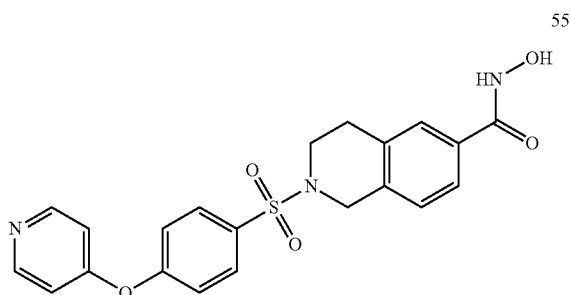
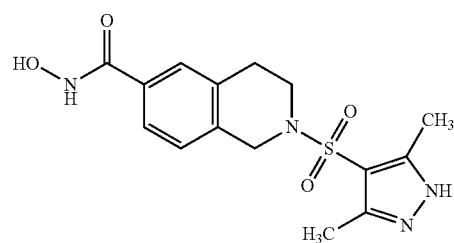
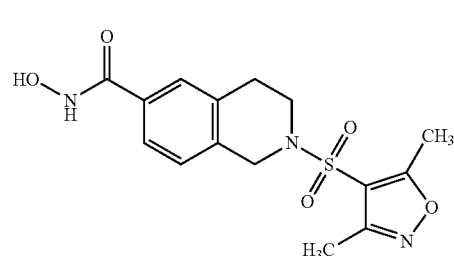
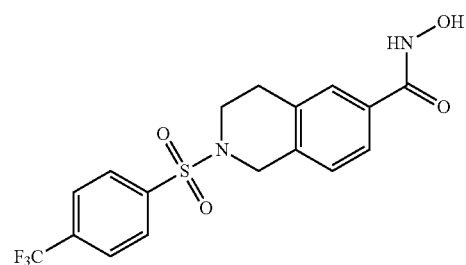
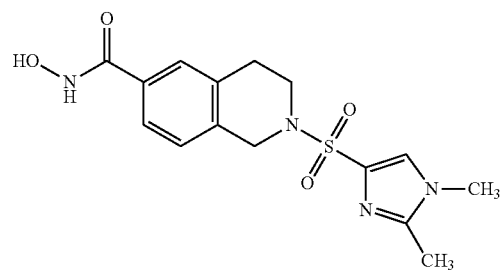
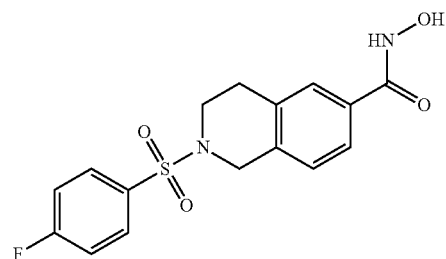


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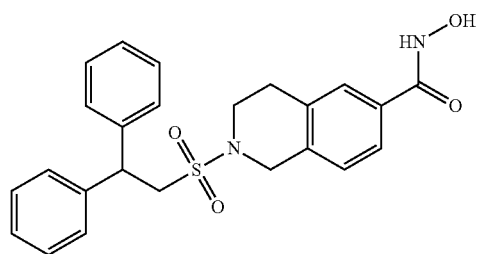
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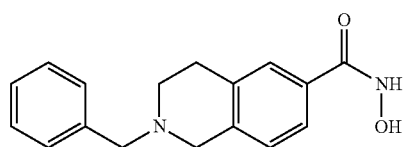


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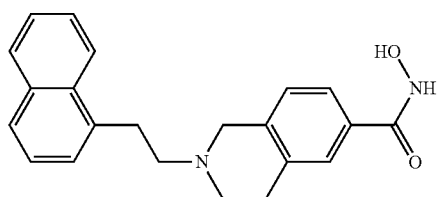
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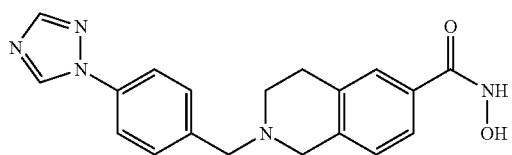
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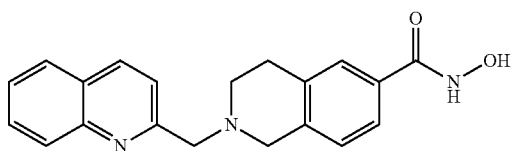
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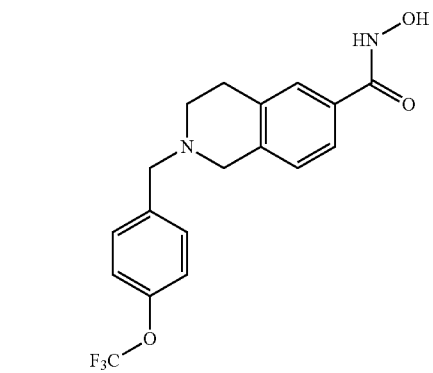
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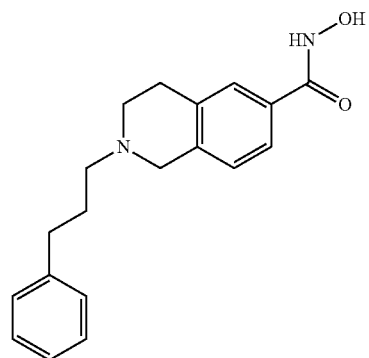
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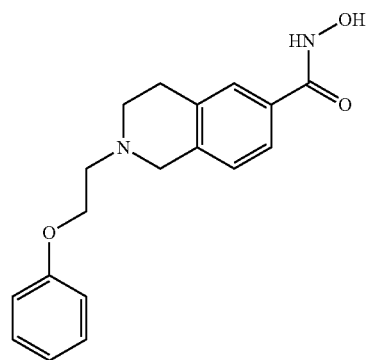
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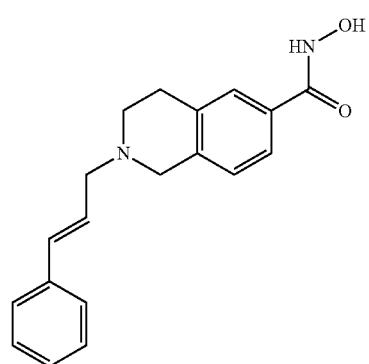
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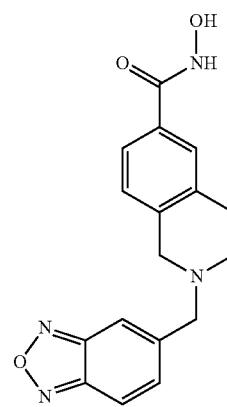
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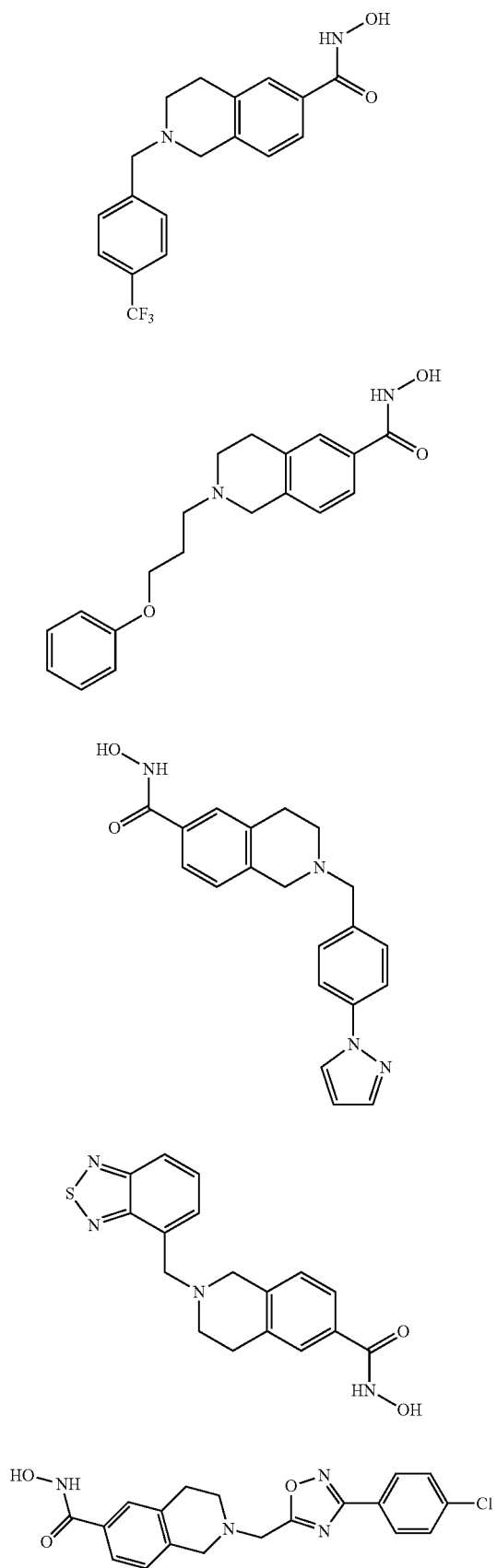
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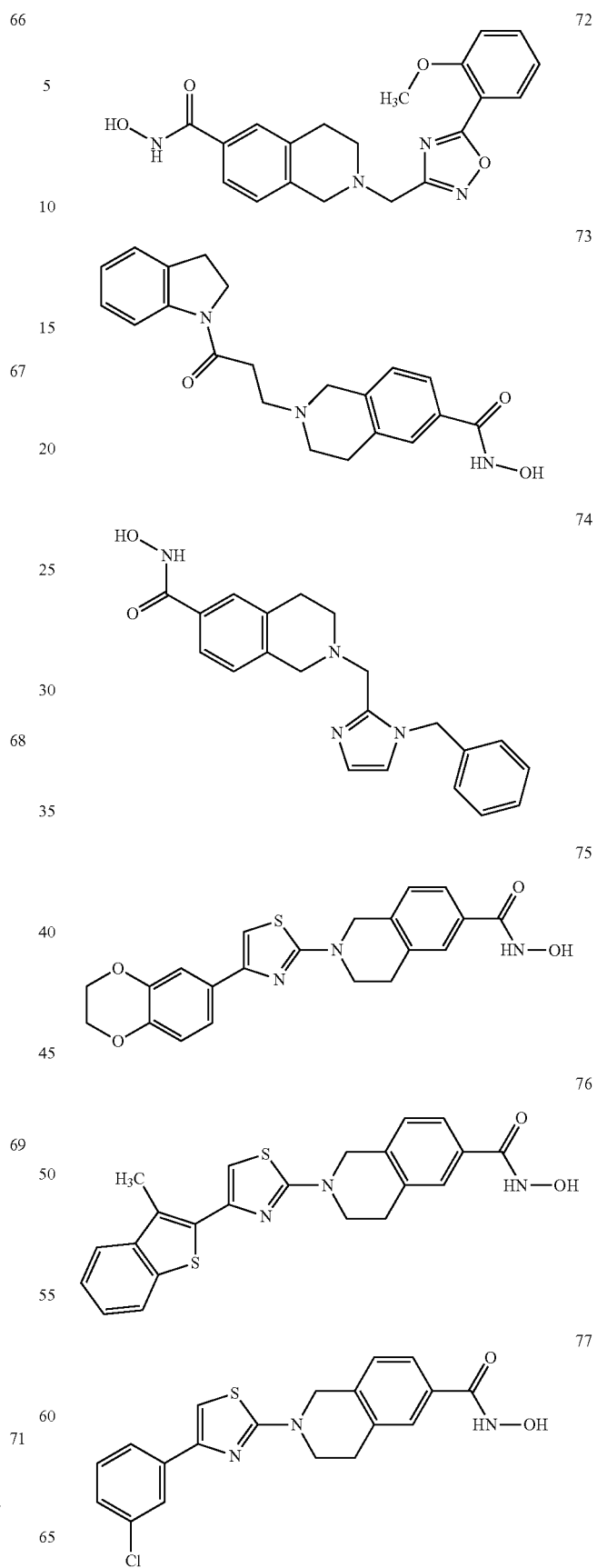
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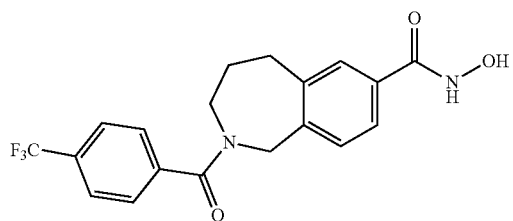
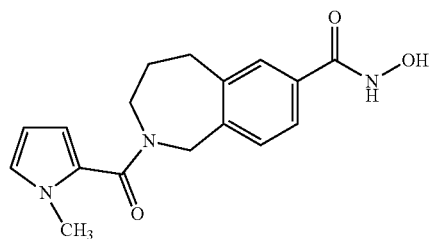
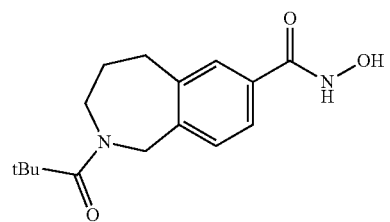
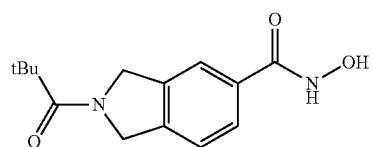
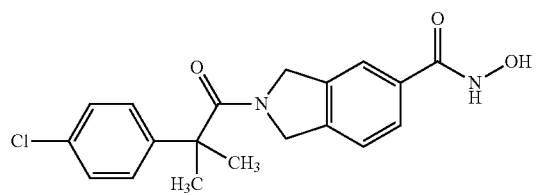
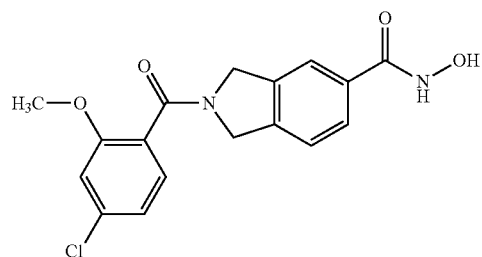
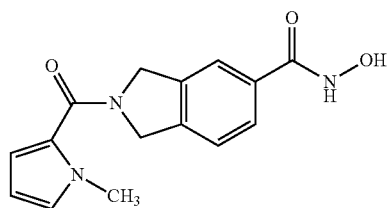
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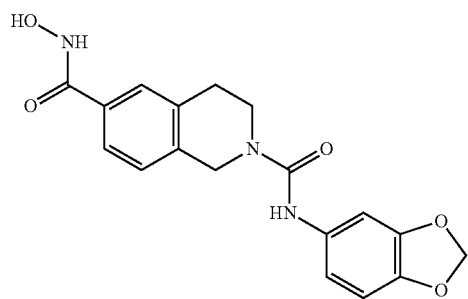
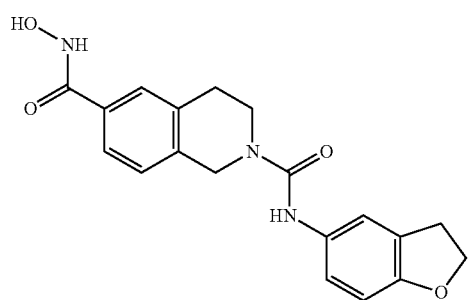
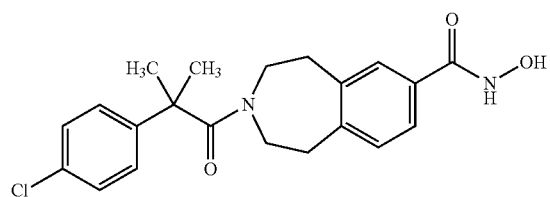
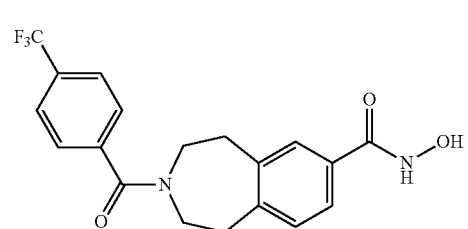
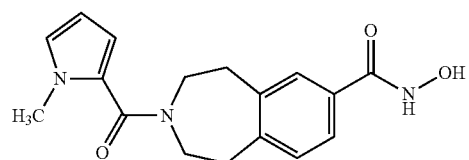
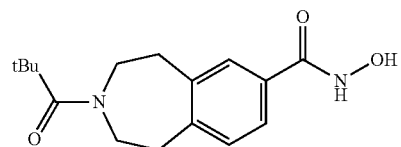


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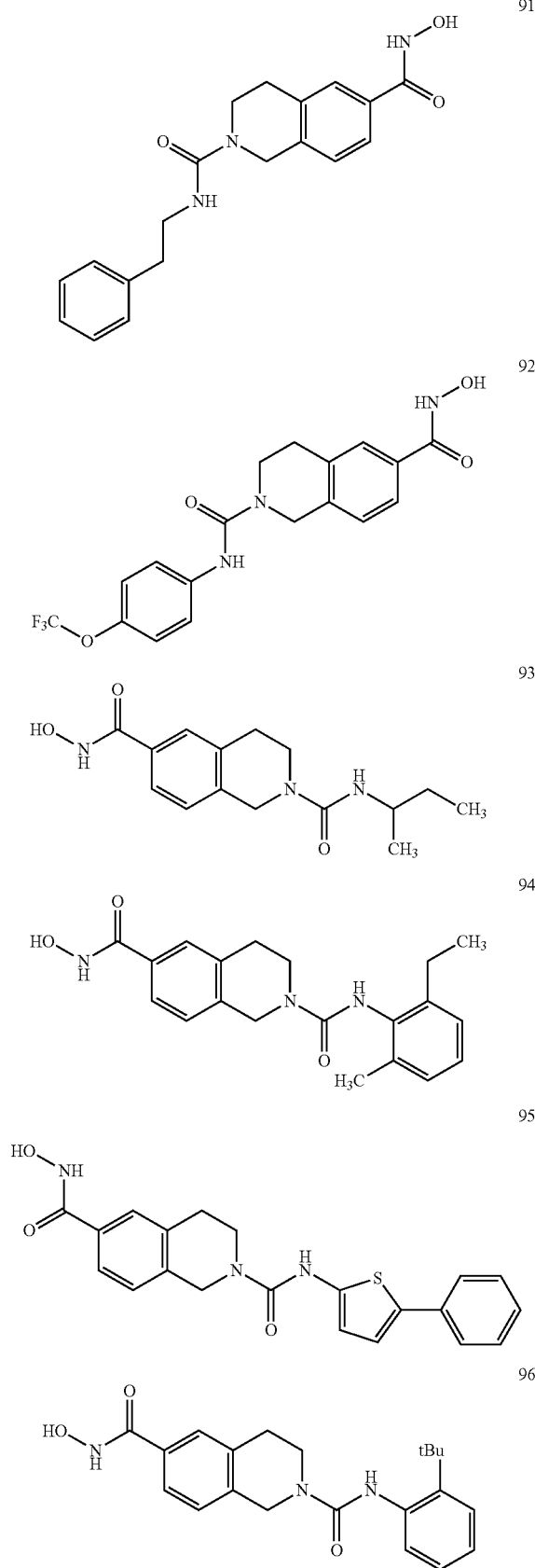
**70**

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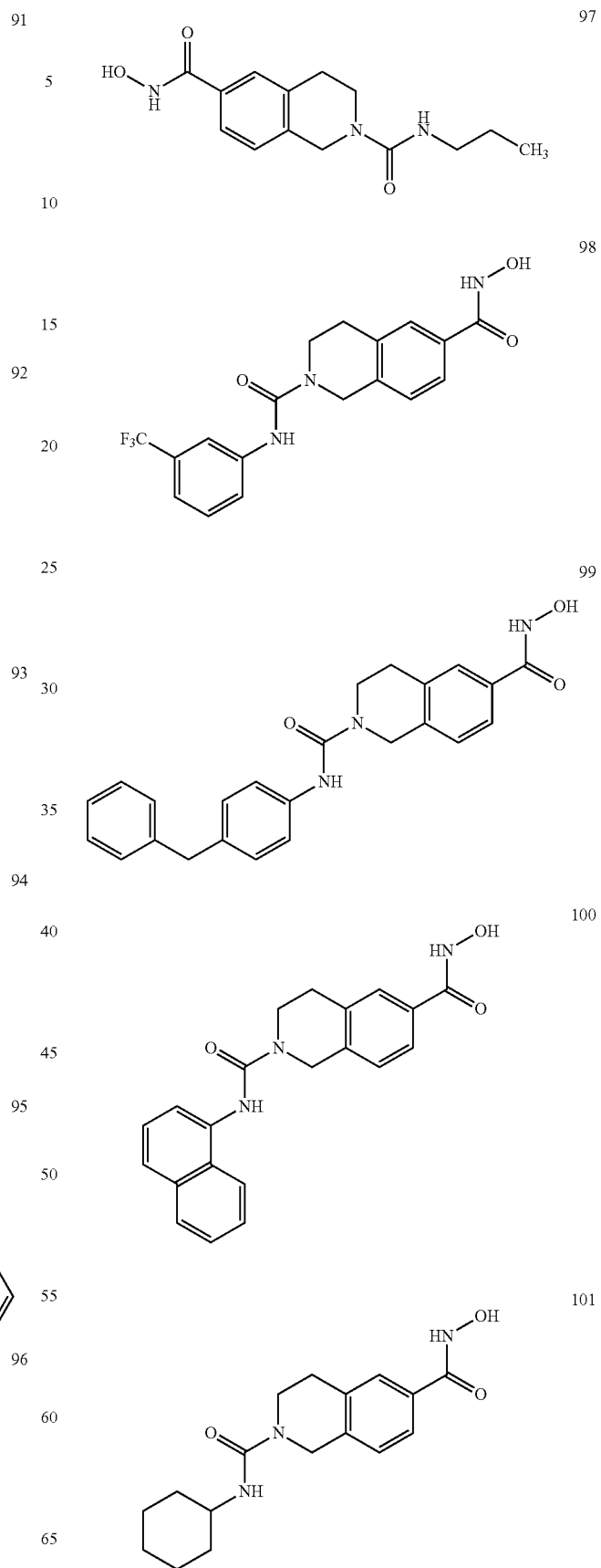


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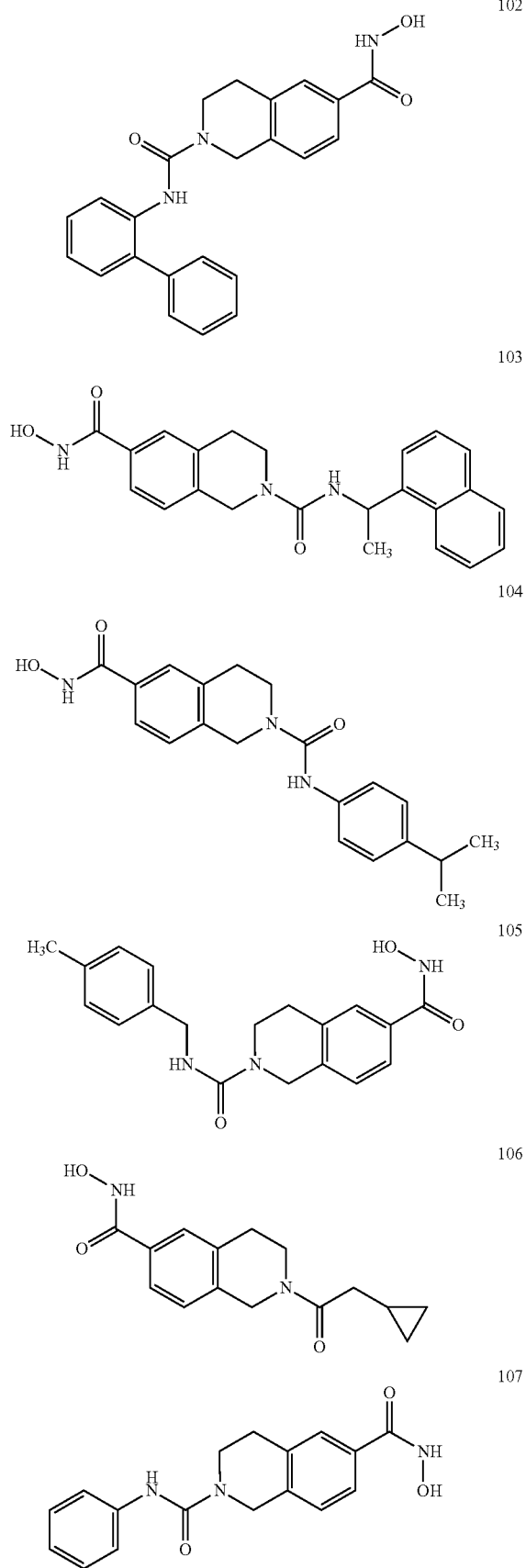
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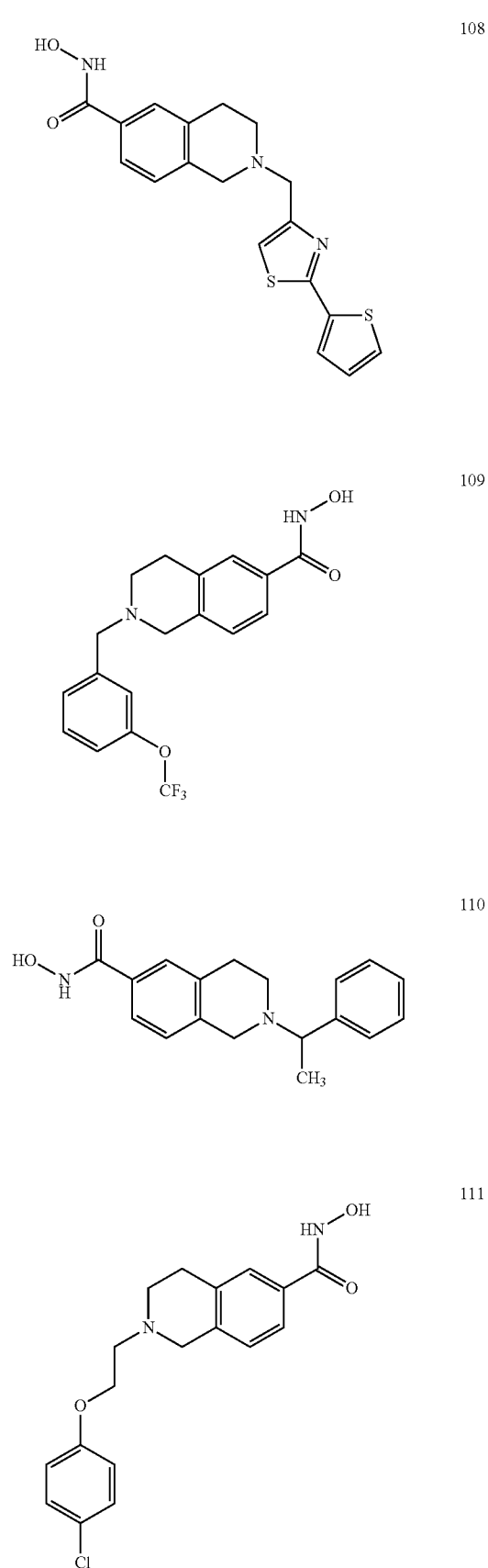


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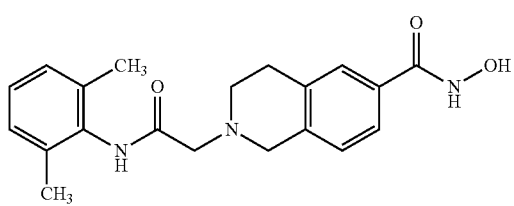
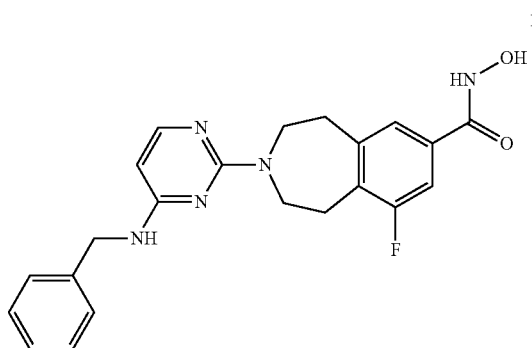
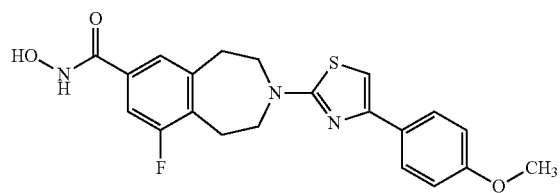
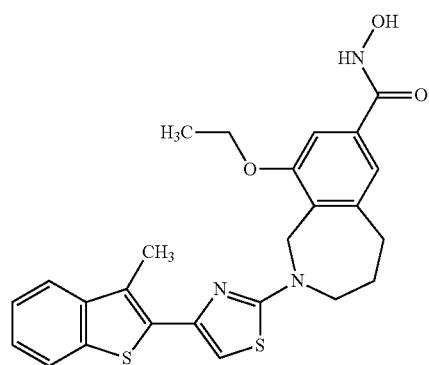
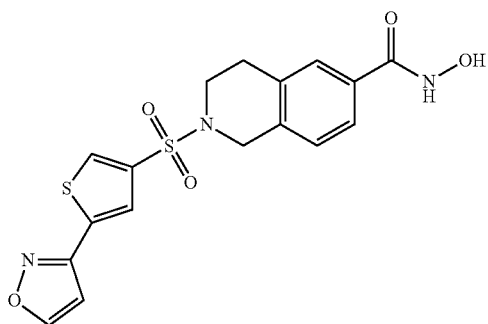
**74**

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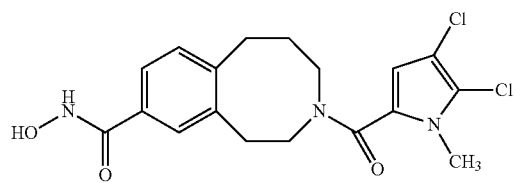
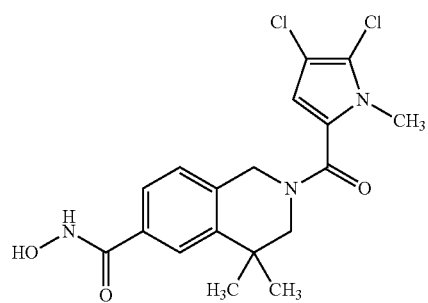
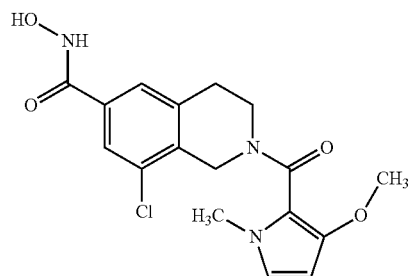
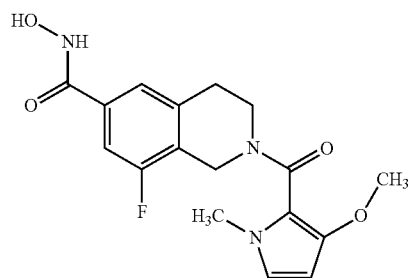
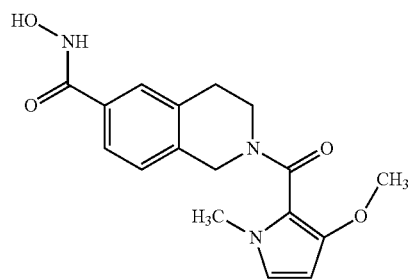


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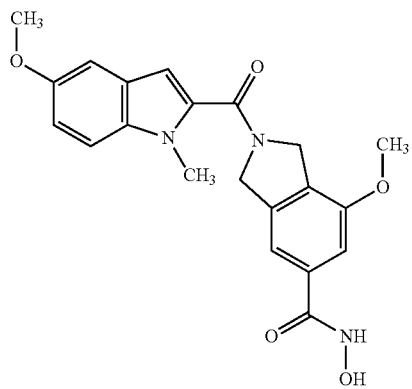
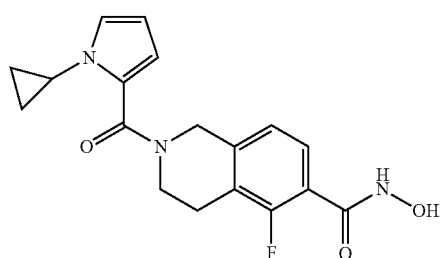
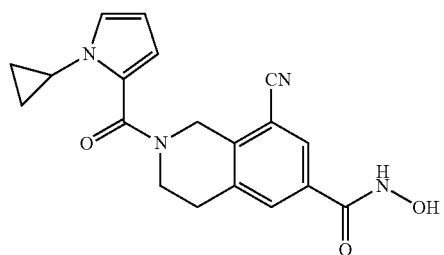
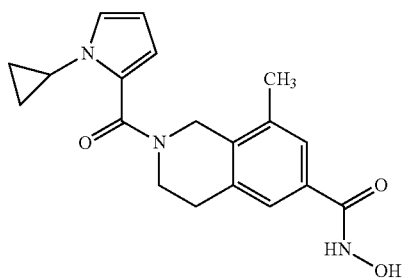
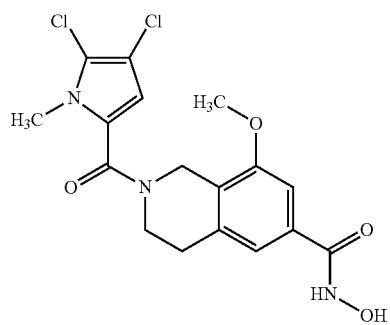
**76**

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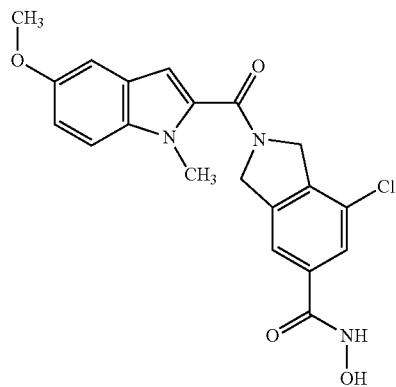
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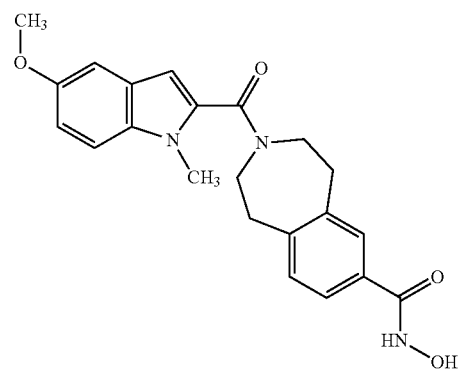
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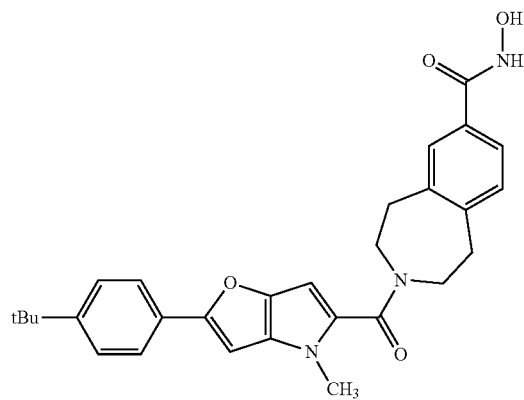
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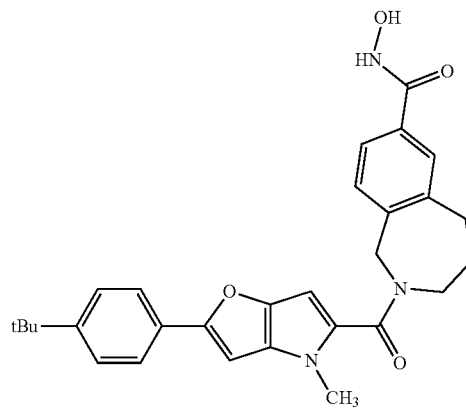
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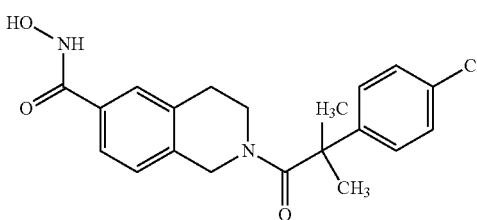
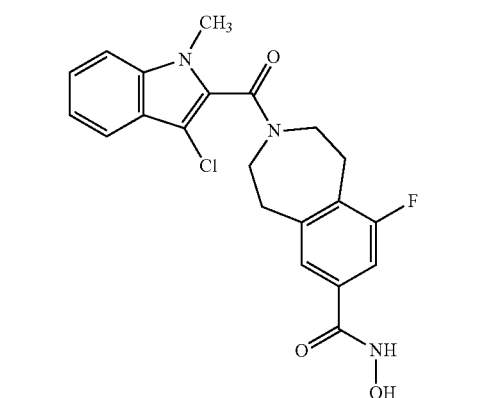
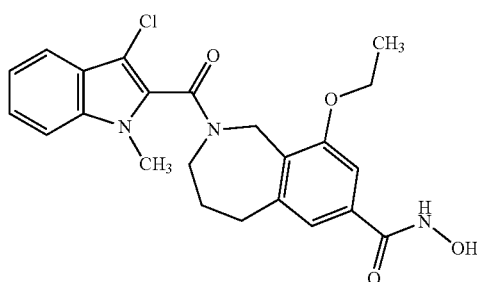
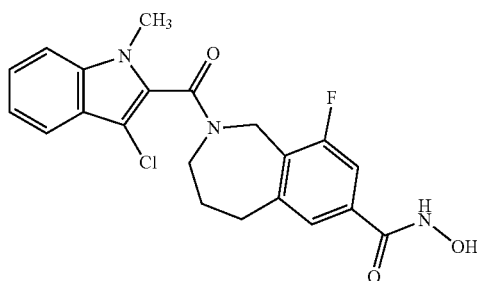
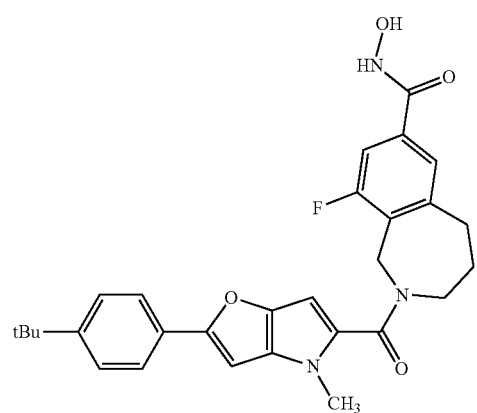


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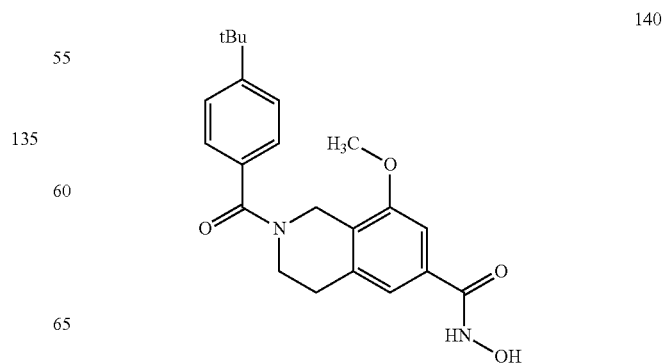
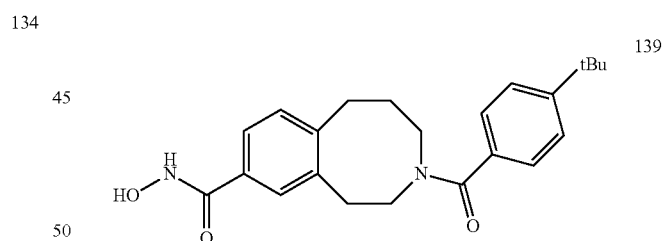
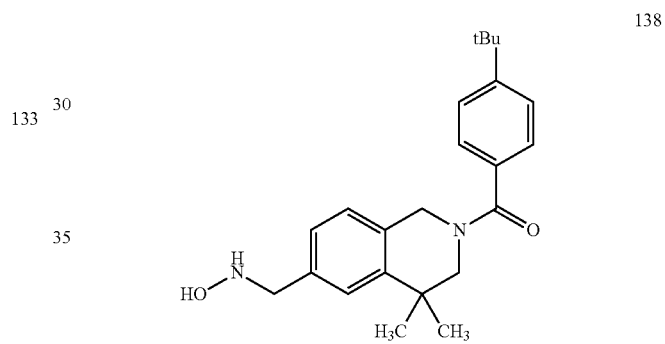
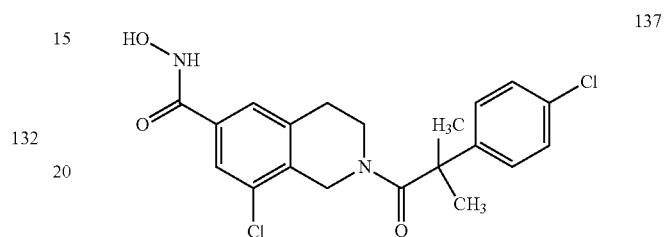
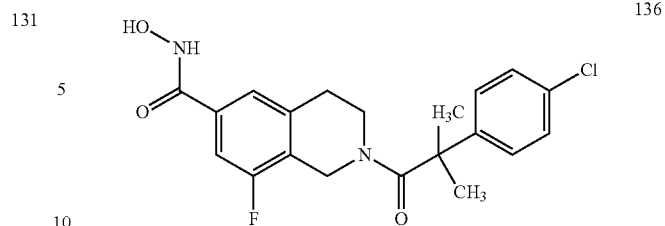


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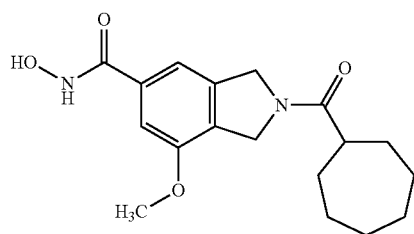
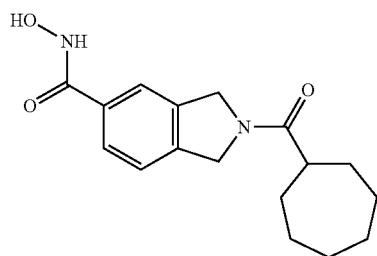
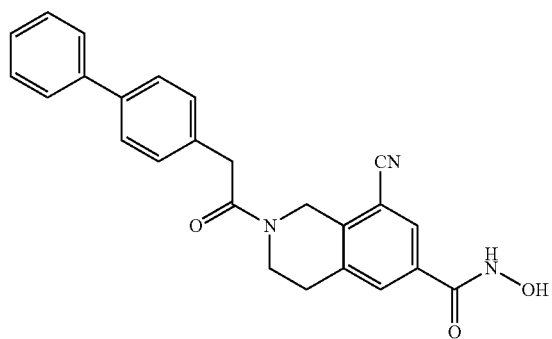
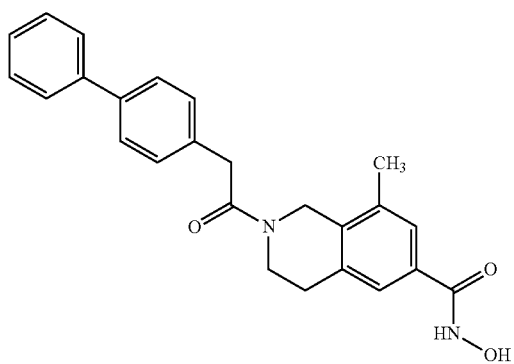
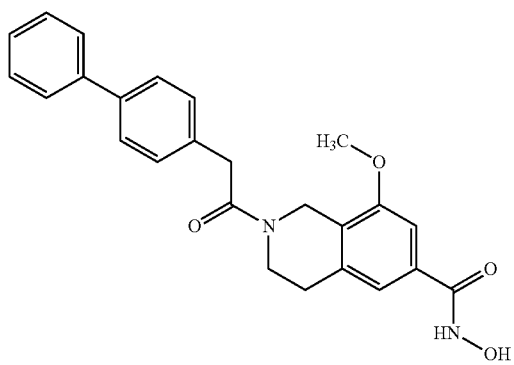
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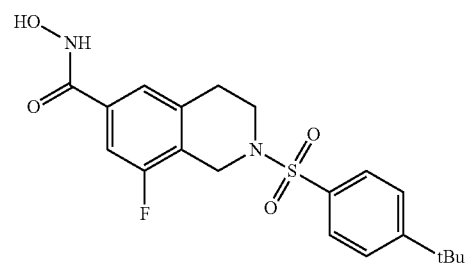
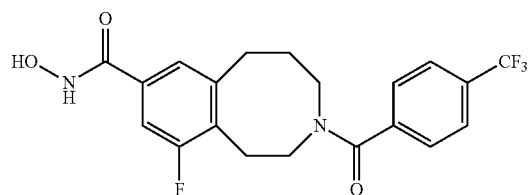
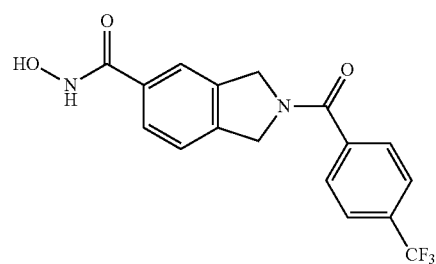
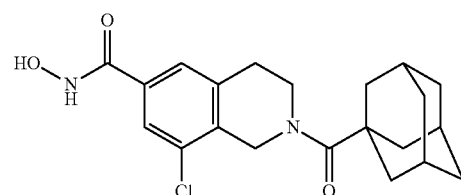
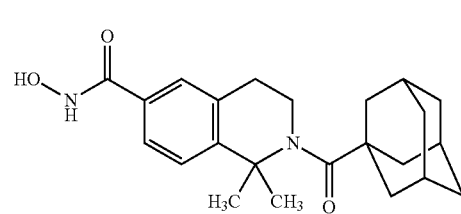
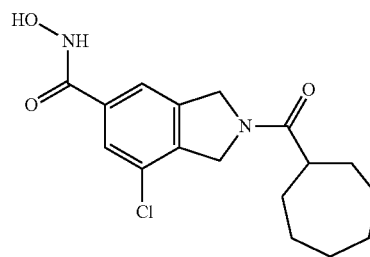


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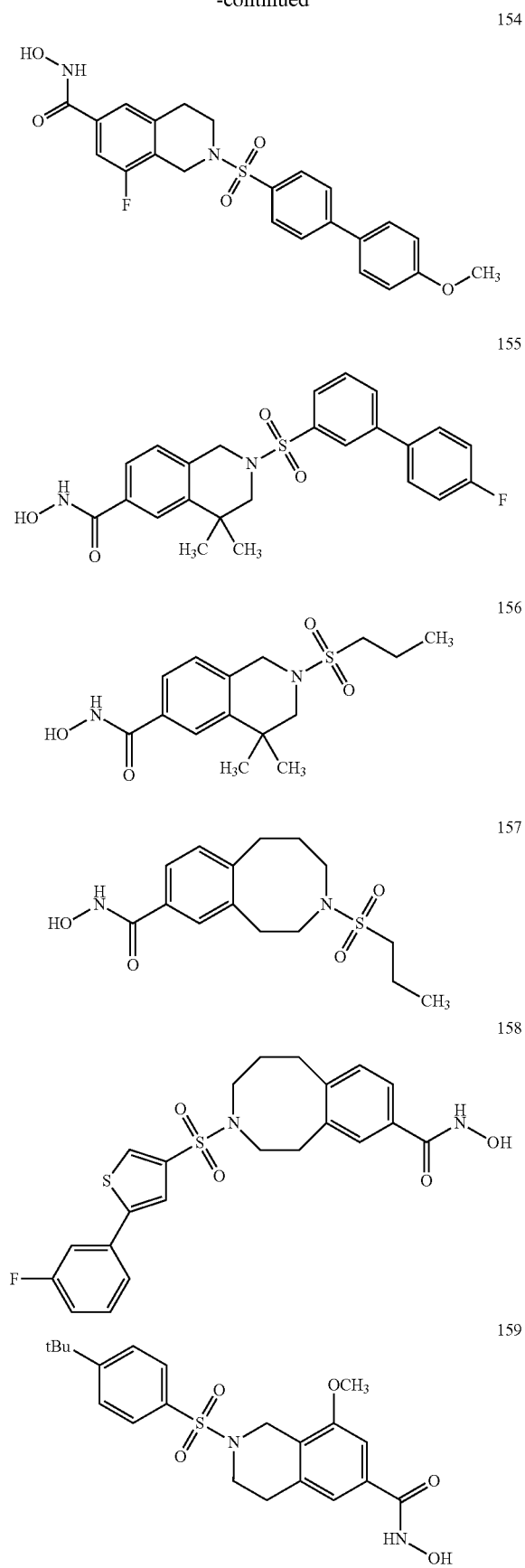
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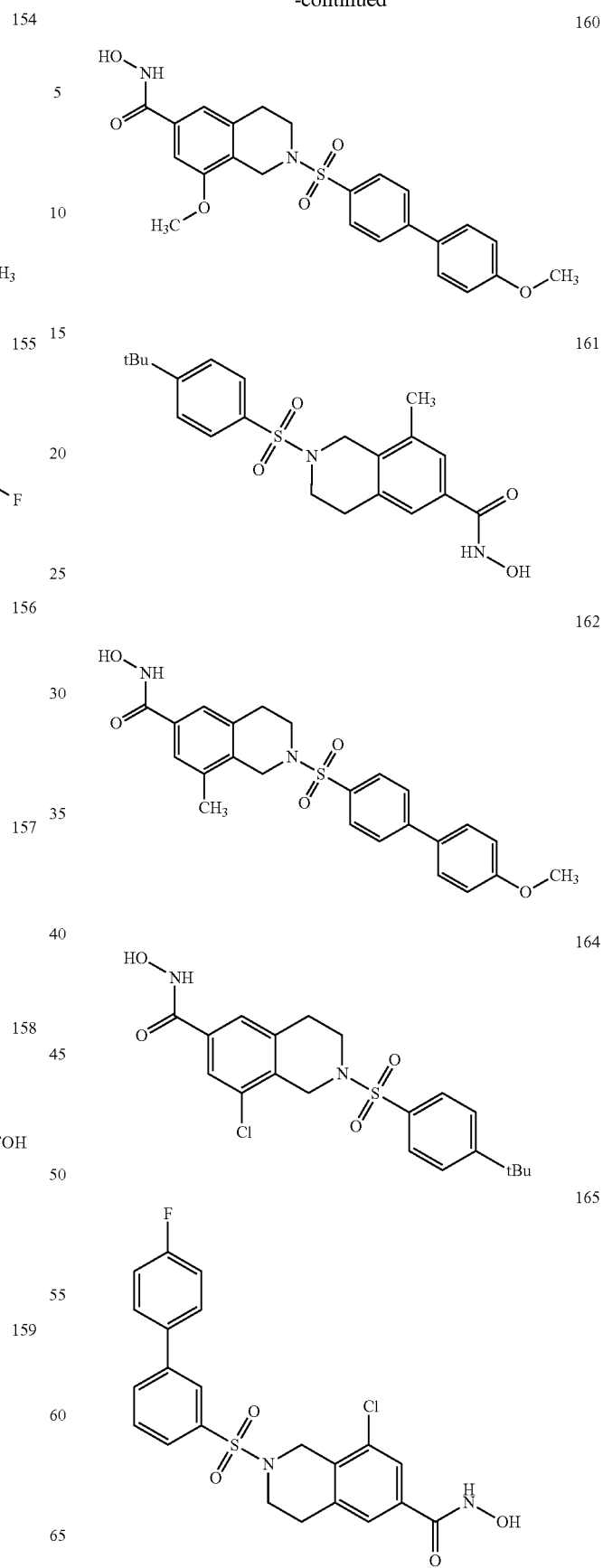


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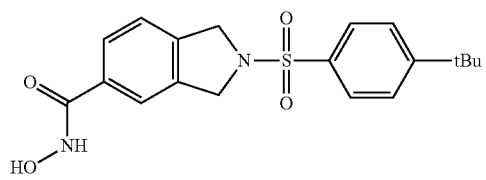
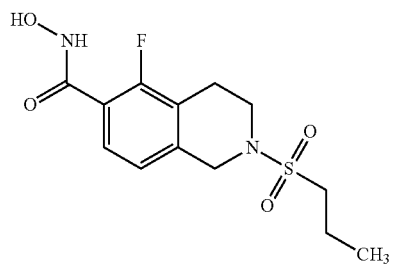
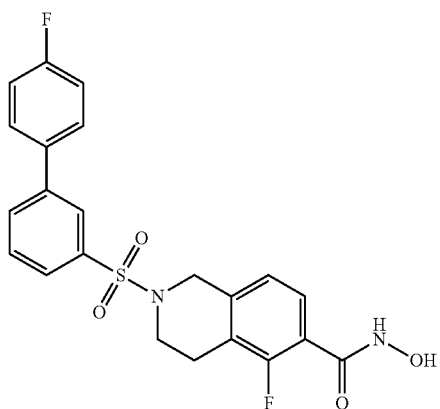
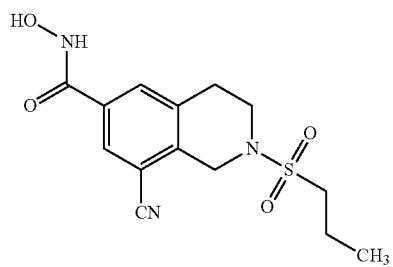
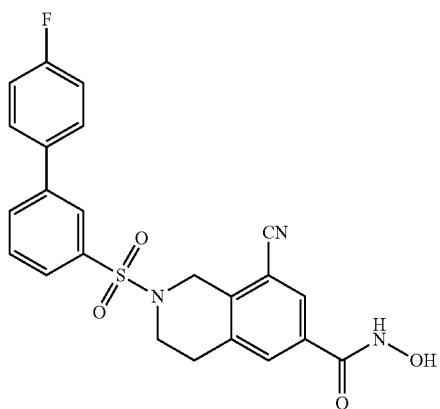
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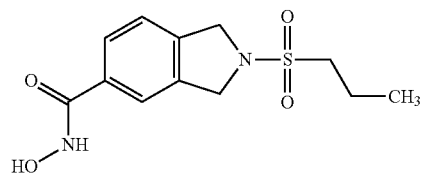
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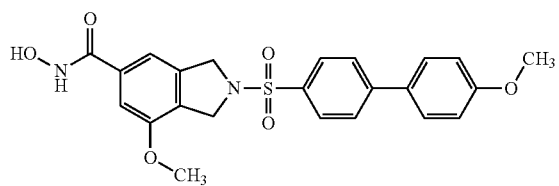
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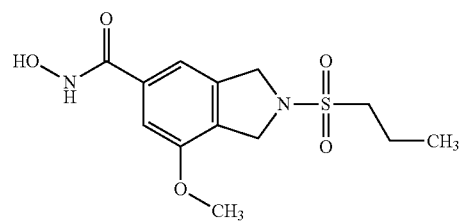


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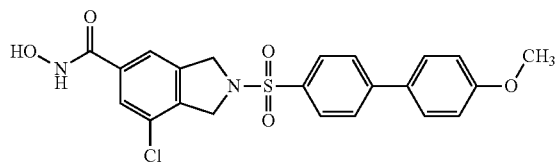
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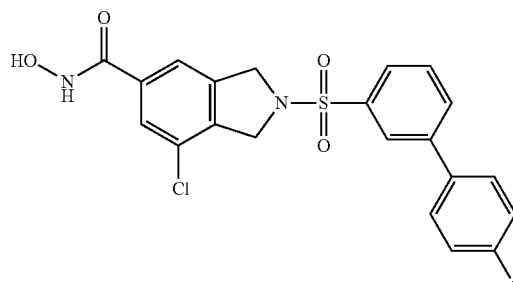
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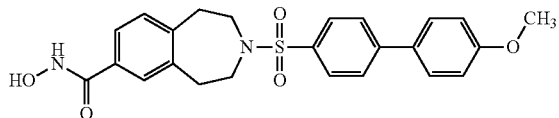


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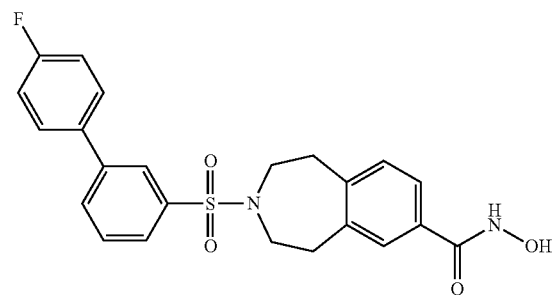


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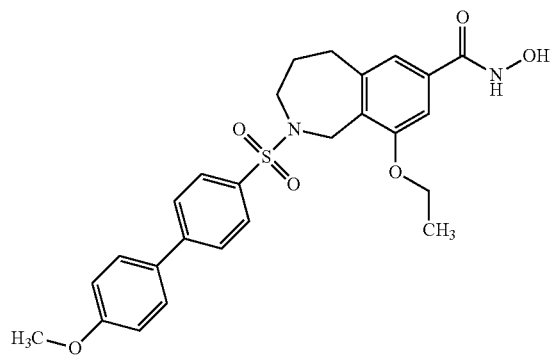
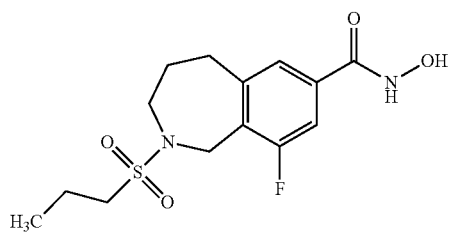
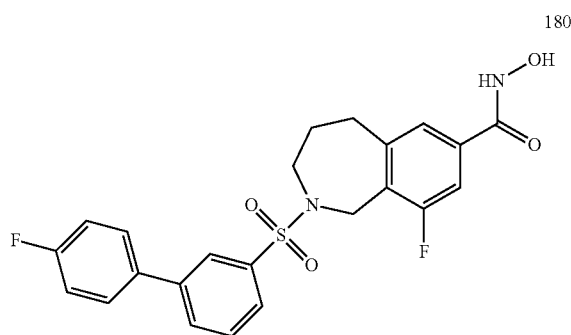
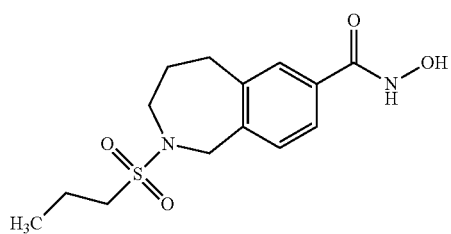
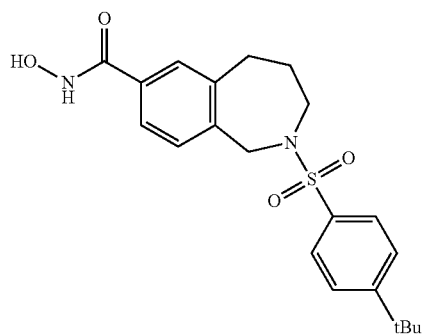
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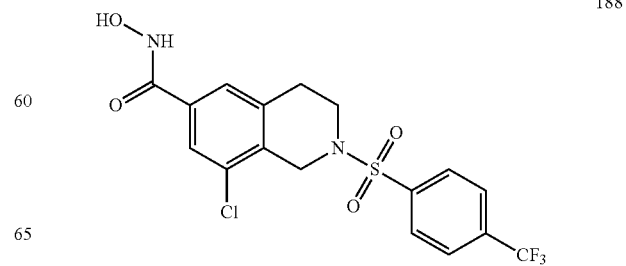
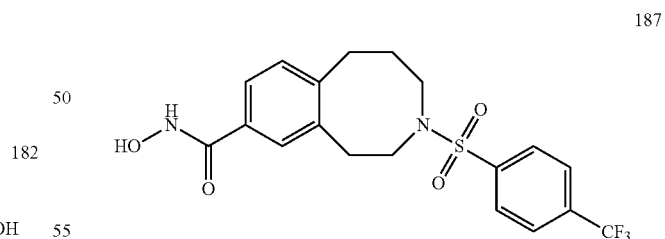
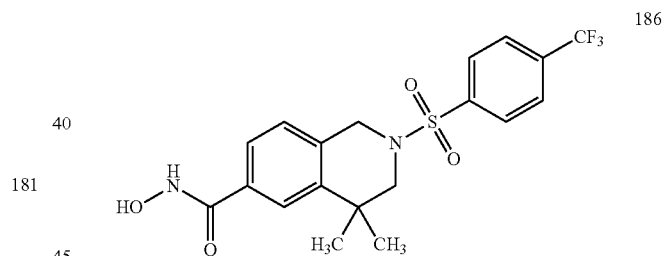
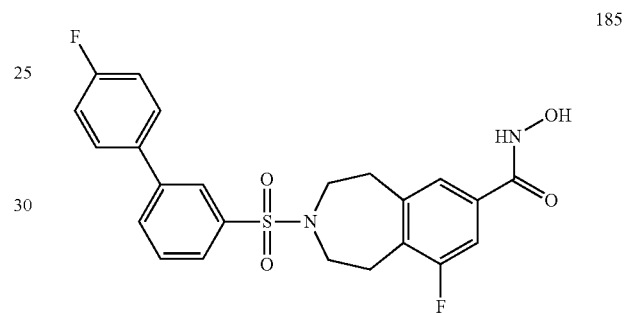
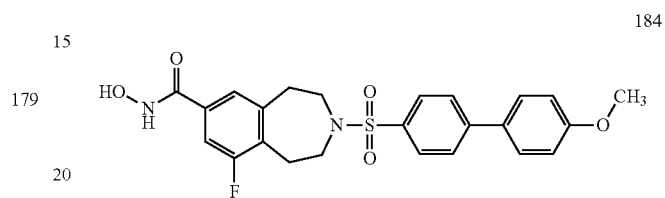
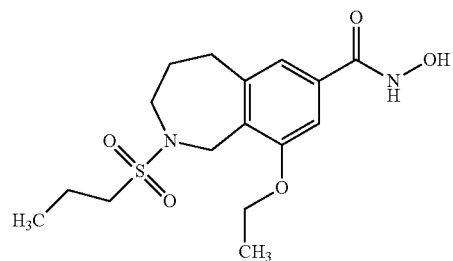


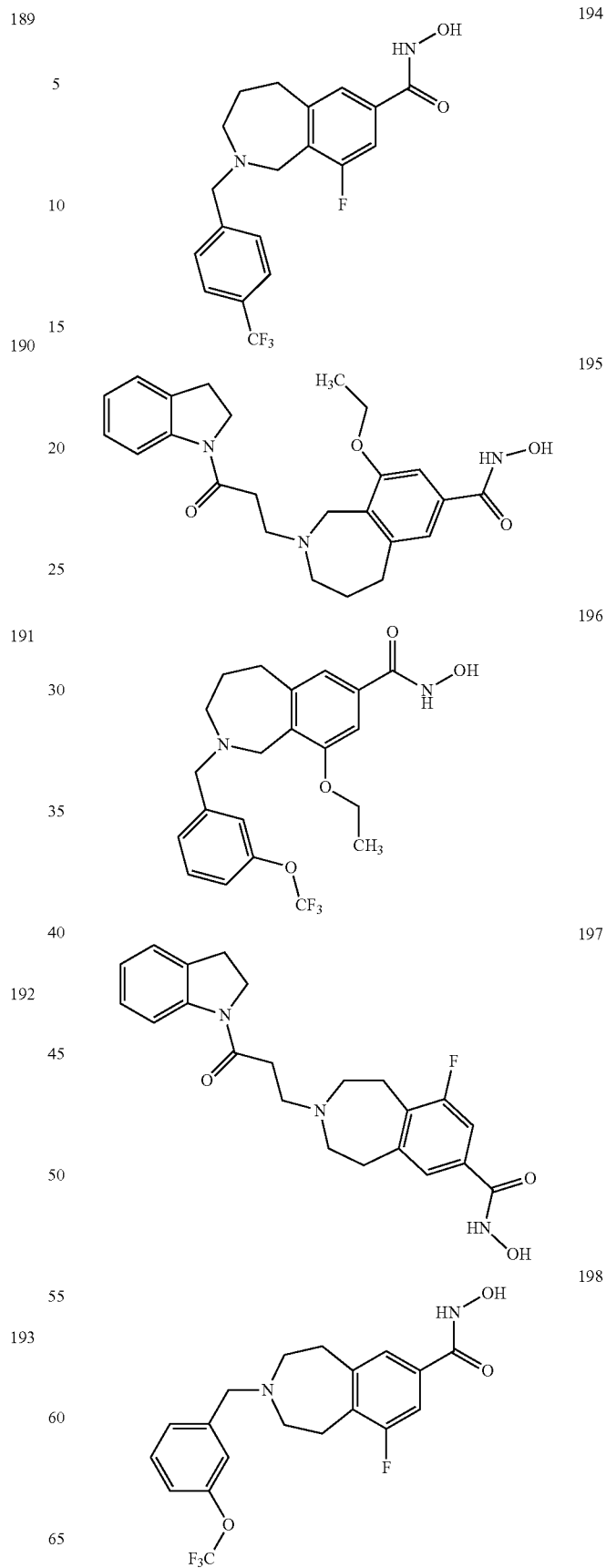
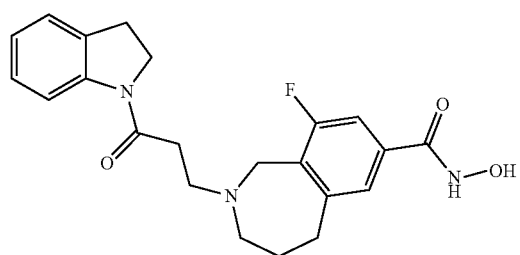
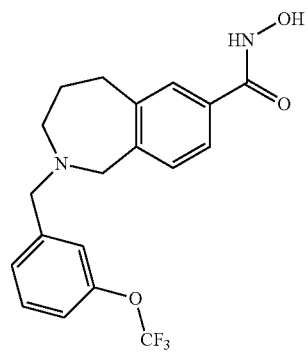
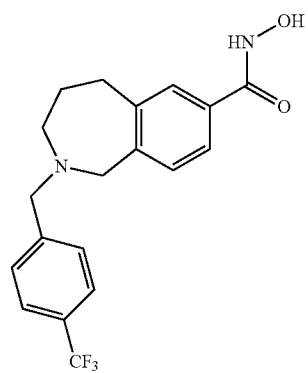
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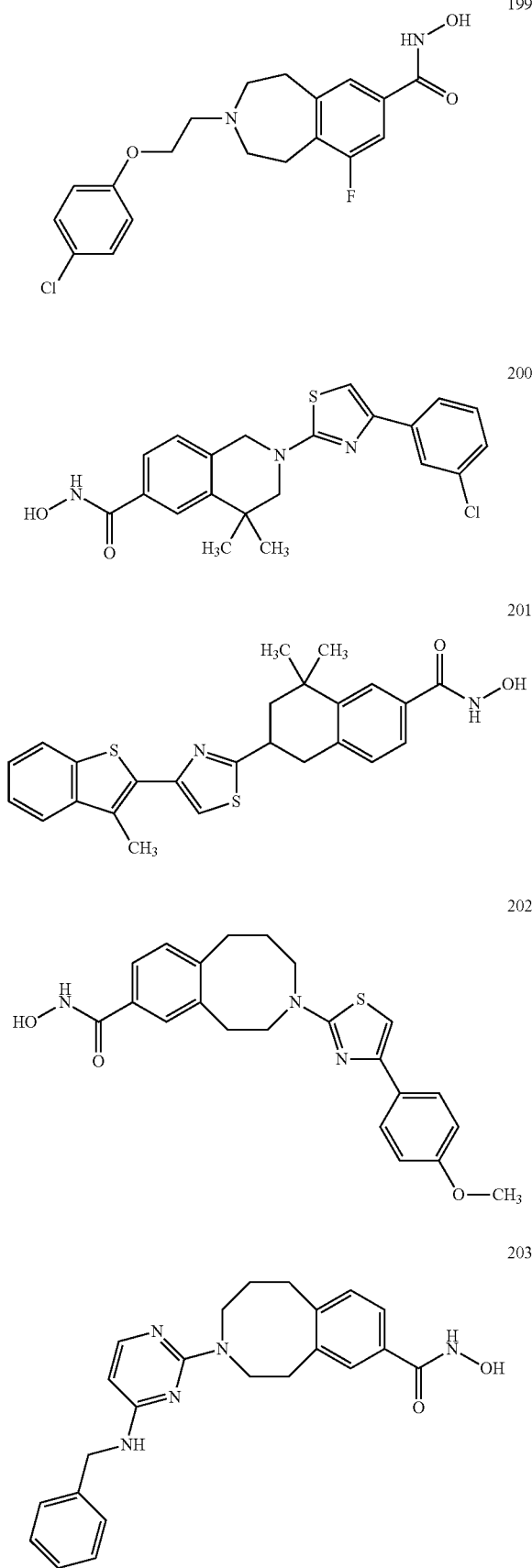
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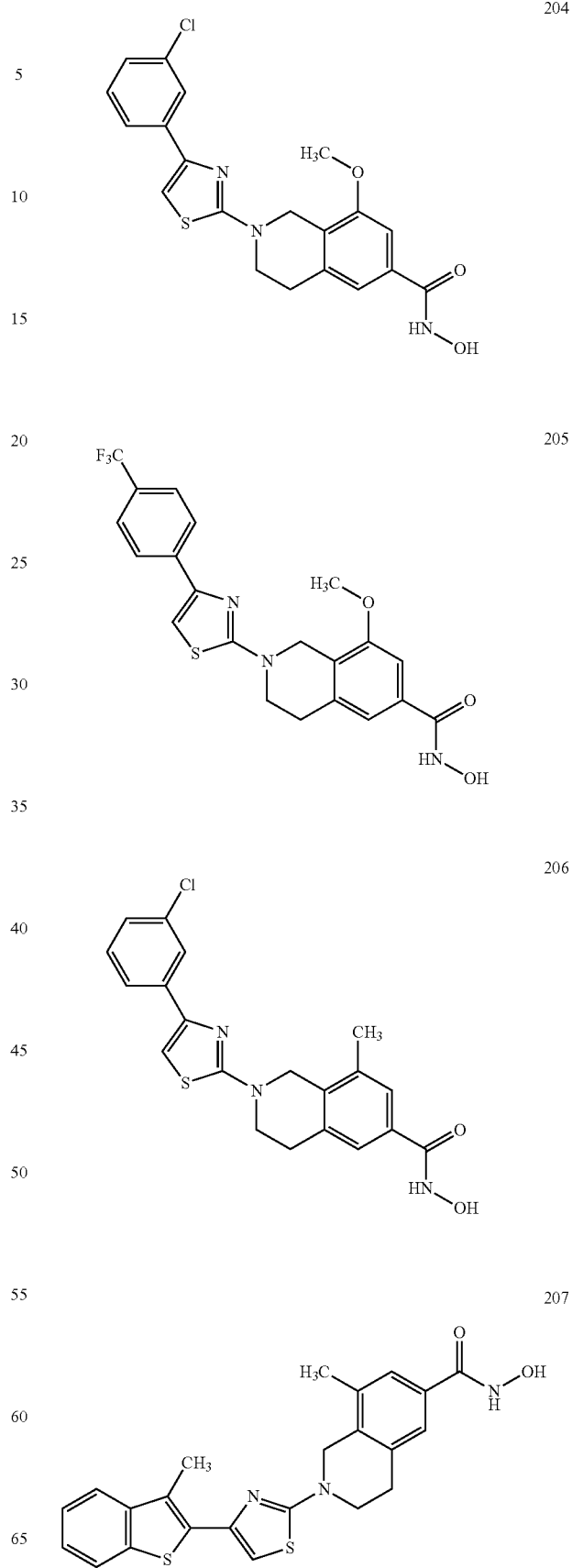


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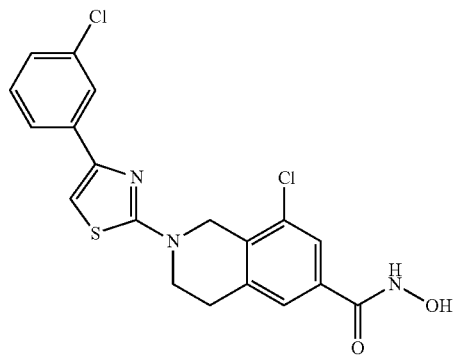
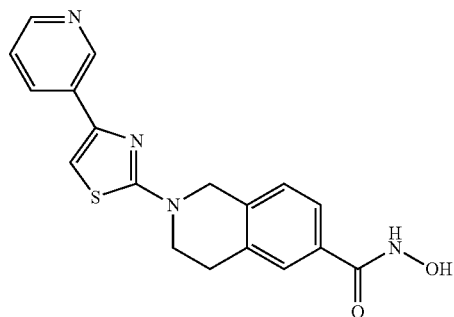
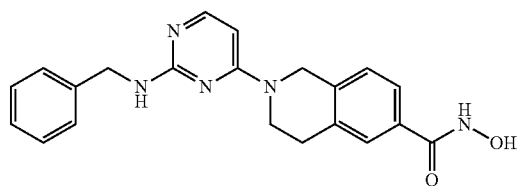
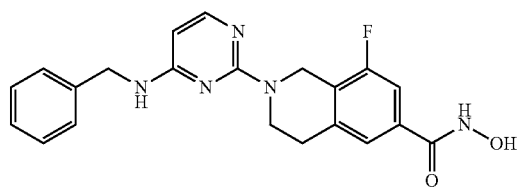
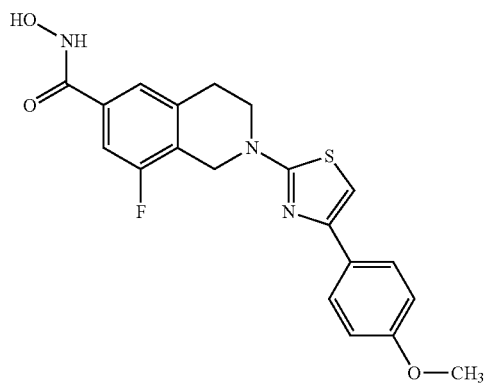
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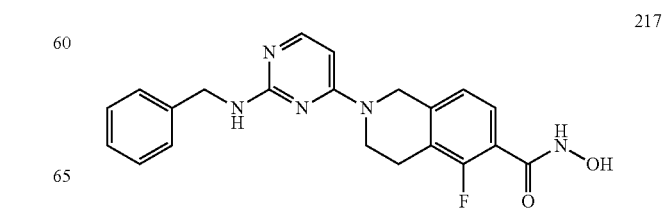
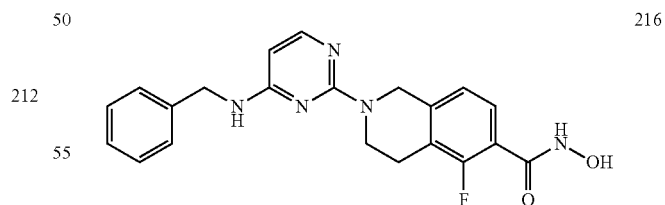
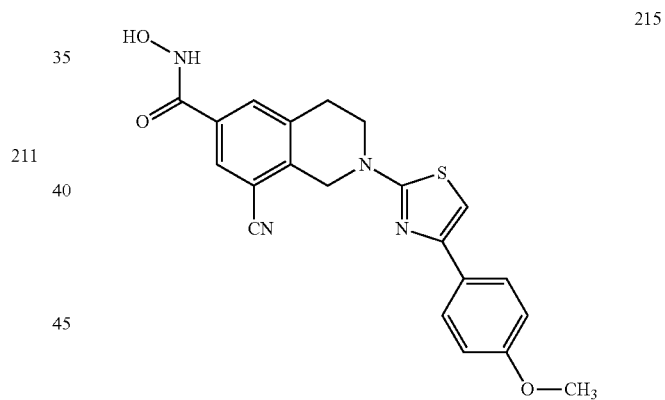
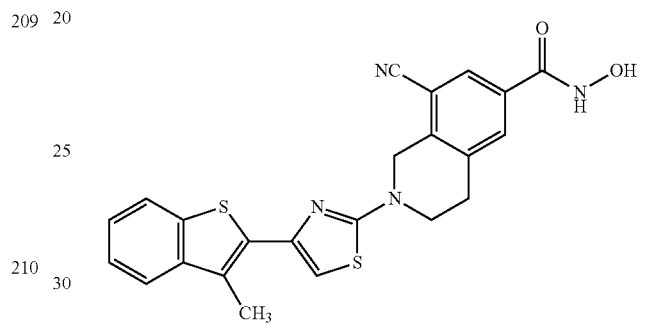
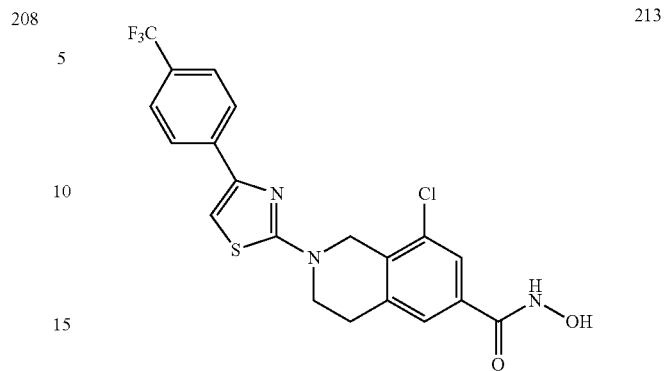


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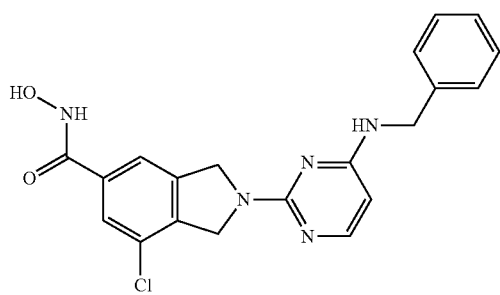
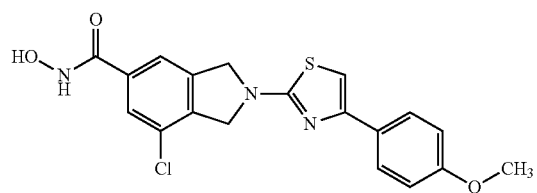
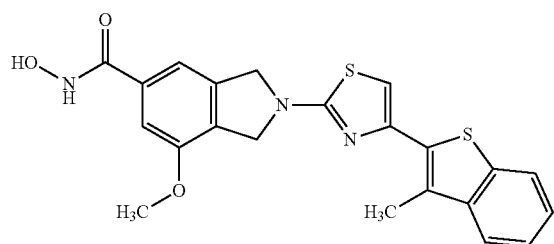
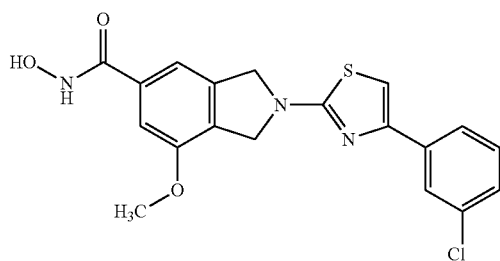
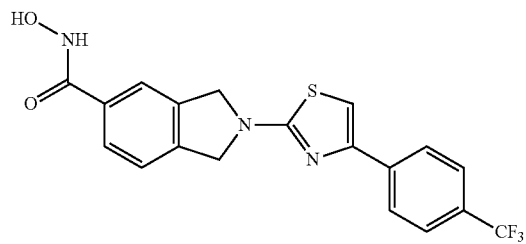
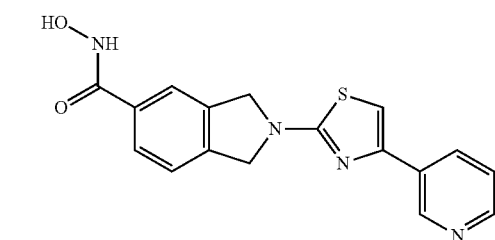
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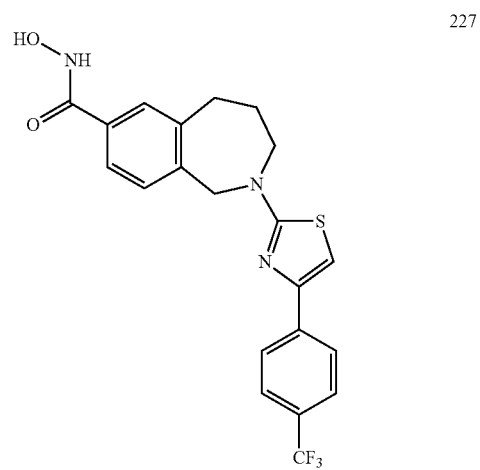
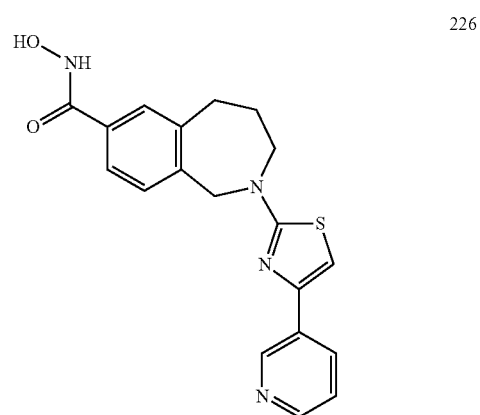
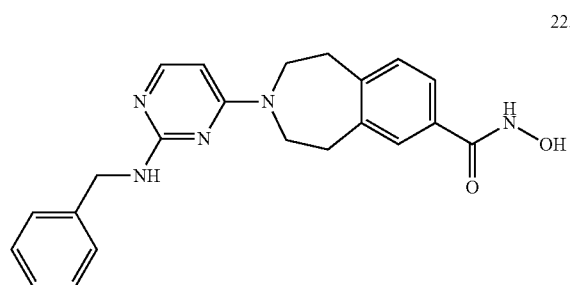
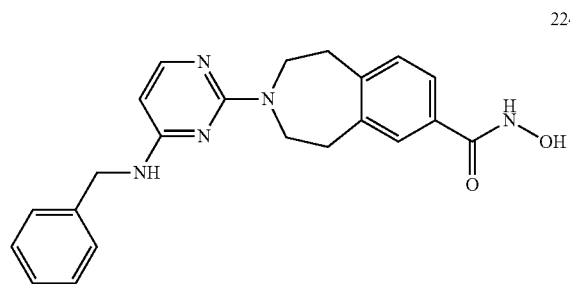


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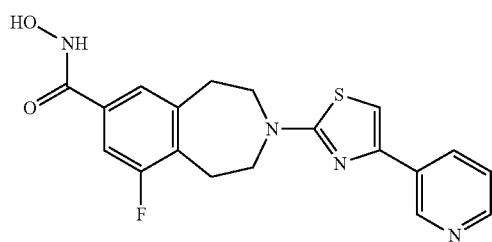
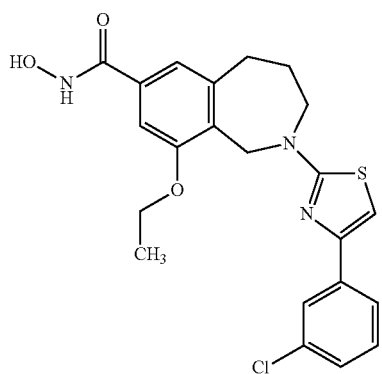
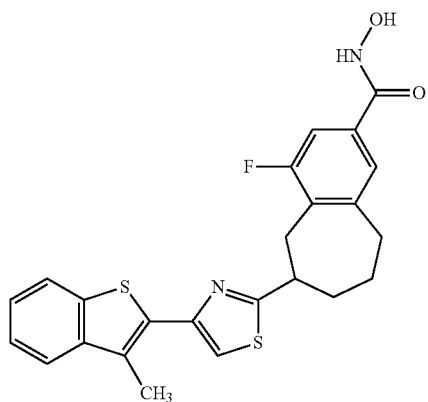
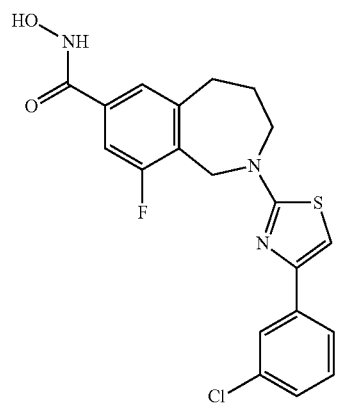
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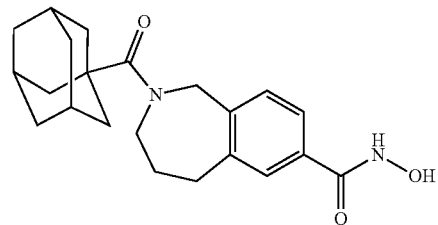
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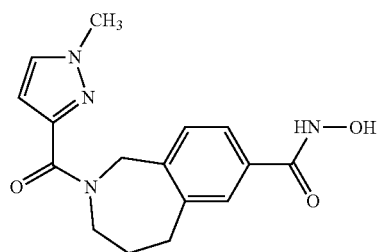
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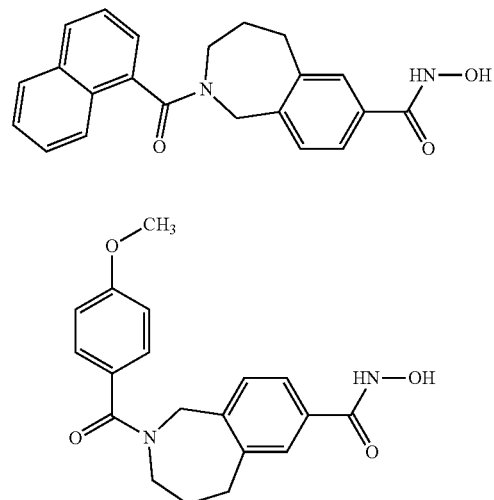
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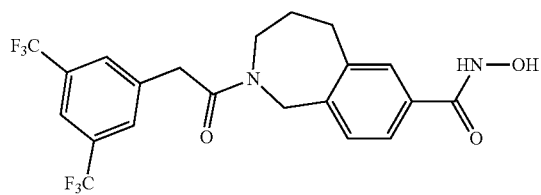


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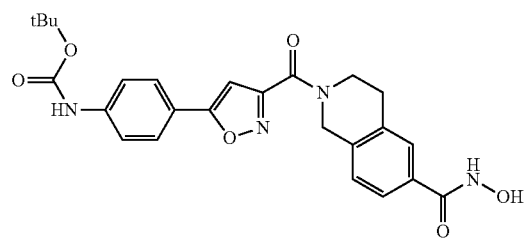


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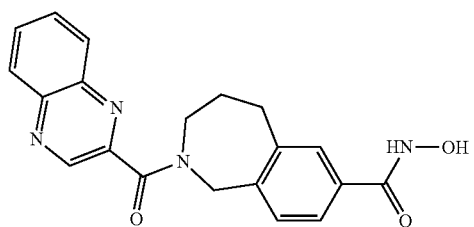
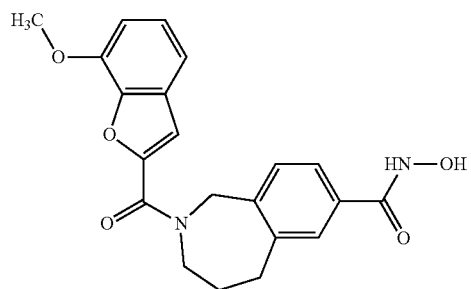
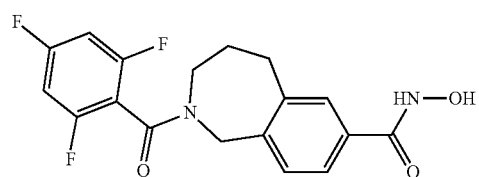
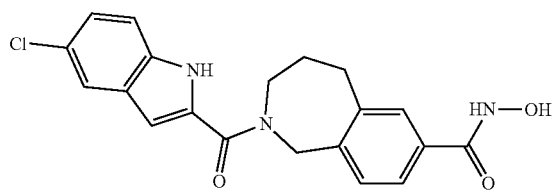
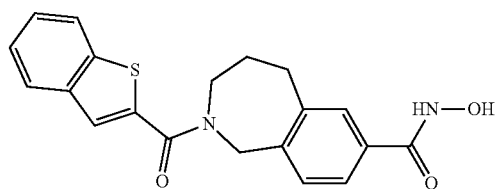
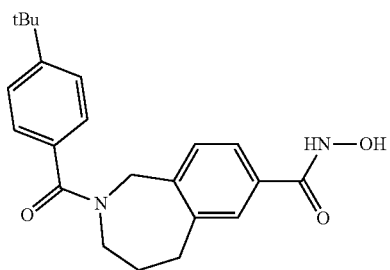
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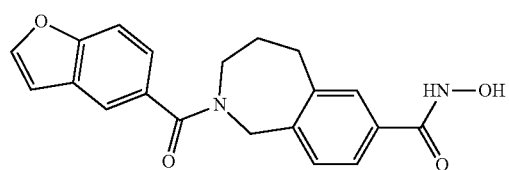
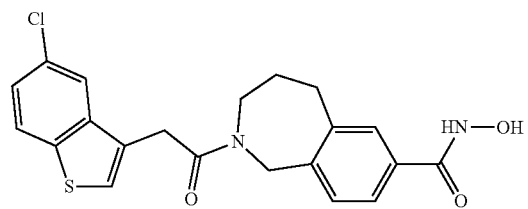
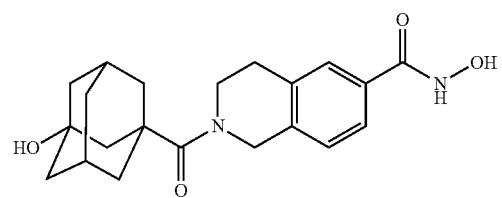
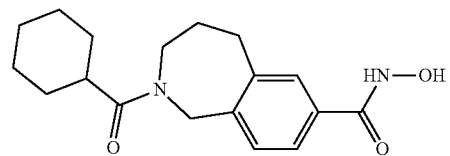
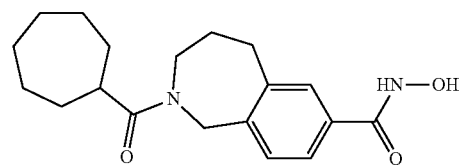
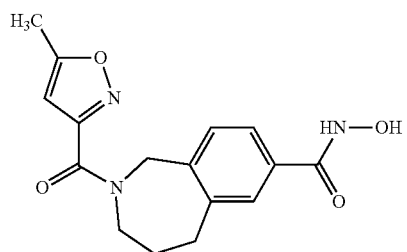
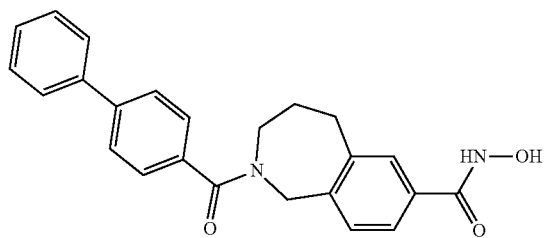
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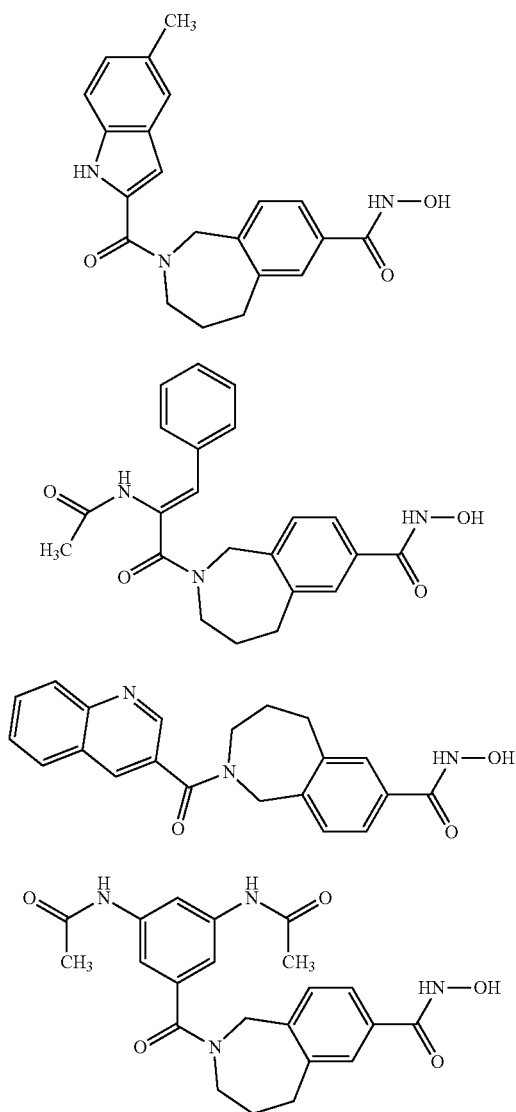
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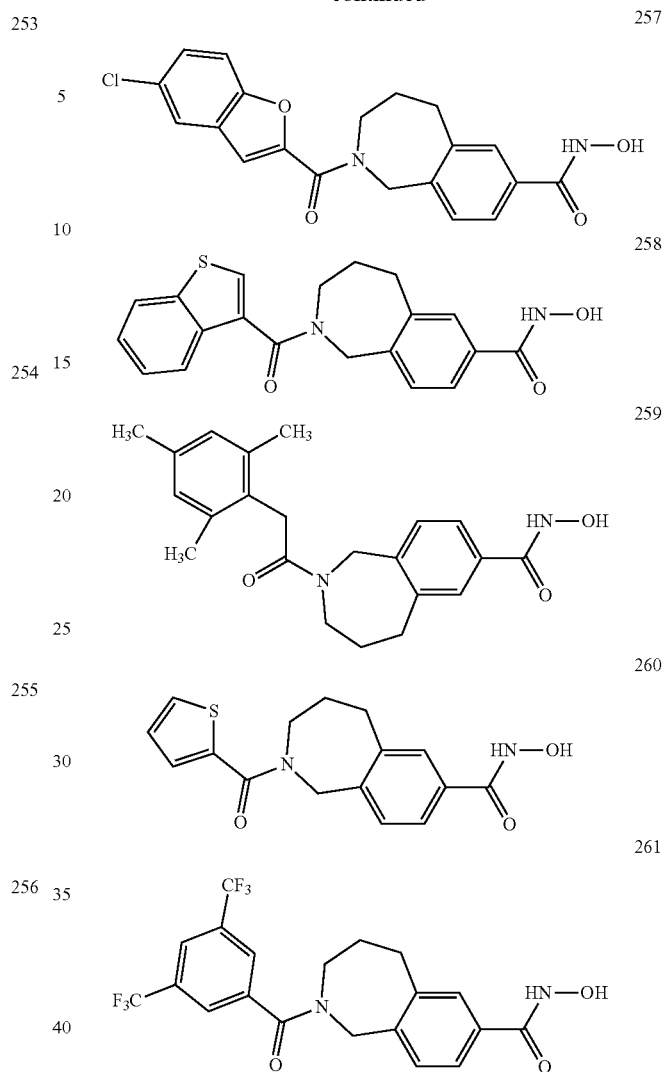


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The compounds in Table 1 above may also be identified by the following chemical names:

- 1 N-hydroxy-2-[(1-methyl-1H-pyrrol-2-yl)carbonyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 2 2-(2,2-dimethylpropanoyl)-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 3 N-hydroxy-2-{[4-(trifluoromethyl)phenyl]acetyl}-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 4 2-[[1-(4-chlorophenyl)cyclobutyl]carbonyl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 5 2-(cyclohexylcarbonyl)-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 6 N-hydroxy-2-[(2-methyl-1,3-thiazol-4-yl)acetyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 7 N-hydroxy-2-[(1-phenyl-1H-pyrazol-4-yl)carbonyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 8 N-hydroxy-2-(1H-indol-2-ylcarbonyl)-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 9 N-hydroxy-2-(3-methylbutanoyl)-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 10 N-hydroxy-2-[2-(4-methylphenyl)propanoyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 11 2-[cyclopentyl(phenyl)acetyl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 12 N-hydroxy-2-(1-naphthoyl)-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 13 N-hydroxy-2-[3-(1H-indol-1-yl)propanoyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 14 N-hydroxy-2-[4-(1H-pyrrol-1-yl)benzoyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 15 N-hydroxy-2-(phenylacetyl)-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 16 2-[(3,5-dimethylisoxazol-4-yl)acetyl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 17 2-[(2R)-2-(acetilamino)-4-methylpentanoyl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 18 N-hydroxy-2-[(5-methyl-1-phenyl-1H-pyrazol-4-yl)carbonyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 19 N-hydroxy-2-(2-methylbut-3-enoyl)-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 20 2-(2-amino-2-methyl-3-phenylpropanoyl)-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 21 N-hydroxy-2-(phenoxyacetyl)-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 22 2-(cycloheptylcarbonyl)-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 23 N-hydroxy-2-[(1-methylcyclopropyl)carbonyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 24 N-hydroxy-2-(tetrahydrofuran-3-ylcarbonyl)-1,2,3,4-tetrahydroisoquinoline-6-carboxamide

- 25 2-(cyclopentylacetyl)-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 26 2-(cyclohex-3-en-1-ylcarbonyl)-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 27 N-hydroxy-2-(3-methyl-2-phenylbutanoyl)-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 28 N-hydroxy-2-[(1-methylcyclohexyl)carbonyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 29 N-hydroxy-2-[(2S)-2-phenylpropanoyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 30 2-(biphenyl-4-ylacetyl)-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 31 2-[(3,5-dimethyl-1H-pyrazol-1-yl)acetyl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 32 2-(cyclopentylcarbonyl)-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 33 2-[1-adamantylcarbonyl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 34 N-hydroxy-2-[(3-methoxyphenyl)acetyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 35 N-hydroxy-2-[(4-isopropylphenyl)acetyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 36 2-[(1-acetylpiperidin-4-yl)carbonyl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 37 N-hydroxy-2-[(5-methyl-3-(trifluoromethyl)-1H-pyrazol-1-yl)acetyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 38 2-(butylsulfonyl)-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 39 2-(benzylsulfonyl)-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 40 N-hydroxy-2-(propylsulfonyl)-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 41 N-hydroxy-2-[(2-oxo-2,3-dihydro-1,3-benzoxazol-6-yl)sulfonyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 42 N-hydroxy-2-[(4-isopropylphenyl)sulfonyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 43 N-hydroxy-2-[(4-methoxybiphenyl-4-yl)sulfonyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 44 2-[(4-tert-butylphenyl)sulfonyl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 45 N-hydroxy-2-[(4-methylphenyl)sulfonyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 46 N-hydroxy-2-(phenylsulfonyl)-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 47 N-hydroxy-2-(2-naphthylsulfonyl)-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 48 2-[(4'-fluorobiphenyl-3-yl)sulfonyl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 49 N-hydroxy-2-[(4-methoxyphenyl)sulfonyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 50 2-[(4-fluorophenyl)sulfonyl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 51 2-[(1,2-dimethyl-1H-imidazol-4-yl)sulfonyl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 52 N-hydroxy-2-[(4-(trifluoromethyl)phenyl)sulfonyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 53 2-[(3,5-dimethylisoxazol-4-yl)sulfonyl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 54 2-[(3,5-dimethyl-1H-pyrazol-4-yl)sulfonyl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 55 N-hydroxy-2-[(4-(pyridin-4-yloxy)phenyl)sulfonyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 56 2-[(2,2-diphenylethyl)sulfonyl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 57 2-benzyl-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 58 N-hydroxy-2-[2-(1-naphthyl)ethyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 59 N-hydroxy-2-[4-(1H-1,2,4-triazol-1-yl)benzyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 60 N-hydroxy-2-(quinolin-2-ylmethyl)-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 61 N-hydroxy-2-[4-(trifluoromethoxy)benzyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 62 N-hydroxy-2-(3-phenylpropyl)-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 63 N-hydroxy-2-(2-phenoxyethyl)-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 64 N-hydroxy-2-[(2E)-3-phenylprop-2-en-1-yl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 65 2-(2,1,3-benzoxadiazol-5-ylmethyl)-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 66 N-hydroxy-2-[4-(trifluoromethyl)benzyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 67 N-hydroxy-2-(3-phenoxypropyl)-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 68 N-hydroxy-2-[4-(1H-pyrazol-1-yl)benzyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 69 2-(2,1,3-benzothiadiazol-4-ylmethyl)-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 71 2-[[3-(4-chlorophenyl)-1,2,4-oxadiazol-5-yl]methyl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 72 N-hydroxy-2-[[5-(2-methoxyphenyl)-1,2,4-oxadiazol-3-yl]methyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 73 2-[3-(2,3-dihydro-1H-indol-1-yl)-3-oxopropyl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 74 2-[(1-benzyl-1H-imidazol-2-yl)methyl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 75 2-[4-(2,3-dihydro-1,4-benzodioxin-6-yl)-1,3-thiazol-2-yl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 76 N-hydroxy-2-[4-(3-methyl-1-benzothien-2-yl)-1,3-thiazol-2-yl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 77 2-[4-(3-chlorophenyl)-1,3-thiazol-2-yl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
- 78 N-hydroxy-2-[(1-methyl-1H-pyrrol-2-yl)carbonyl]isoindoline-5-carboxamide
- 79 2-(4-chloro-2-methoxybenzoyl)-N-hydroxyisoindoline-5-carboxamide
- 80 2-[2-(4-chlorophenyl)-2-methylpropanoyl]-N-hydroxyisoindoline-5-carboxamide
- 81 2-(2,2-dimethylpropanoyl)-N-hydroxyisoindoline-5-carboxamide
- 82 2-(2,2-dimethylpropanoyl)-N-hydroxy-2,3,4,5-tetrahydro-1H-2-benzazepine-7-carboxamide
- 83 N-hydroxy-2-[(1-methyl-1H-pyrrol-2-yl)carbonyl]-2,3,4,5-tetrahydro-1H-2-benzazepine-7-carboxamide
- 84 N-hydroxy-2-[4-(trifluoromethyl)benzoyl]-2,3,4,5-tetrahydro-1H-2-benzazepine-7-carboxamide
- 85 3-(2,2-dimethylpropanoyl)-N-hydroxy-2,3,4,5-tetrahydro-1H-3-benzazepine-7-carboxamide
- 86 N-hydroxy-3-[(1-methyl-1H-pyrrol-2-yl)carbonyl]-2,3,4,5-tetrahydro-1H-3-benzazepine-7-carboxamide
- 87 N-hydroxy-3-[4-(trifluoromethyl)benzoyl]-2,3,4,5-tetrahydro-1H-3-benzazepine-7-carboxamide
- 88 3-[2-(4-chlorophenyl)-2-methylpropanoyl]-N-hydroxy-2,3,4,5-tetrahydro-1H-3-benzazepine-7-carboxamide
- 89 N²-(2,3-dihydro-1-benzofuran-5-yl)-N⁶-hydroxy-3,4-dihydroisoquinoline-2,6(1H)-dicarboxamide
- 90 N²-1,3-benzodioxol-5-yl-N⁶-hydroxy-3,4-dihydroisoquinoline-2,6(1H)-dicarboxamide
- 91 N⁶-hydroxy-N²-(2-phenylethyl)-3,4-dihydroisoquinoline-2,6(1H)-dicarboxamide
- 92 N⁶-hydroxy-N²-[4-(trifluoromethoxy)phenyl]-3,4-dihydroisoquinoline-2,6(1H)-dicarboxamide
- 93 N²-(sec-butyl)-N⁶-hydroxy-3,4-dihydroisoquinoline-2,6(1H)-dicarboxamide
- 94 N²-(2-ethyl-6-methylphenyl)-N⁶-hydroxy-3,4-dihydroisoquinoline-2,6(1H)-dicarboxamide
- 95 N⁶-hydroxy-N²-(5-phenyl-2-thienyl)-3,4-dihydroisoquinoline-2,6(1H)-dicarboxamide
- 96 N²-(2-tert-butylphenyl)-N⁶-hydroxy-3,4-dihydroisoquinoline-2,6(1H)-dicarboxamide
- 97 N⁶-hydroxy-N²-propyl-3,4-dihydroisoquinoline-2,6(1H)-dicarboxamide
- 98 N⁶-hydroxy-N²-[3-(trifluoromethyl)phenyl]-3,4-dihydroisoquinoline-2,6(1H)-dicarboxamide

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- 99 N²-(4-benzylphenyl)-N⁶-hydroxy-3,4-dihydroisoquinoline-2,6(1H)-dicarboxamide
 100 N⁶-hydroxy-N²-1-naphthyl-3,4-dihydroisoquinoline-2,6(1H)-dicarboxamide
 101 N²-cyclohexyl-N⁶-hydroxy-3,4-dihydroisoquinoline-2,6(1H)-dicarboxamide
 102 N²-biphenyl-2-yl-N⁶-hydroxy-3,4-dihydroisoquinoline-2,6(1H)-dicarboxamide
 103 N⁶-hydroxy-N²-[1-(1-naphthyl)ethyl]-3,4-dihydroisoquinoline-2,6(1H)-dicarboxamide
 104 N⁶-hydroxy-N²-(4-isopropylphenyl)-3,4-dihydroisoquinoline-2,6(1H)-dicarboxamide
 105 N⁶-hydroxy-N²-(4-methylbenzyl)-3,4-dihydroisoquinoline-2,6(1H)-dicarboxamide
 106 2-(cyclopropylacetyl)-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 107 N⁶-hydroxy-N²-phenyl-3,4-dihydroisoquinoline-2,6(1H)-dicarboxamide
 108 N-hydroxy-2-[[2-(2-thienyl)-1,3-thiazol-4-yl]methyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 109 N-hydroxy-2-[3-(trifluoromethoxy)benzyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 110 N-hydroxy-2-(1-phenylethyl)-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 111 2-[2-(4-chlorophenoxy)ethyl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 112 N-hydroxy-2-[(5-isoxazol-3-yl-3-thienyl)sulfonyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 113 9-ethoxy-N-hydroxy-2-[4-(3-methyl-1-benzothien-2-yl)-1,3-thiazol-2-yl]-2,3,4,5-tetrahydro-1H-2-benzazepine-7-carboxamide
 114 9-fluoro-N-hydroxy-3-[4-(4-methoxyphenyl)-1,3-thiazol-2-yl]-2,3,4,5-tetrahydro-1H-3-benzazepine-7-carboxamide
 115 3-[4-(benzylamino)pyrimidin-2-yl]-9-fluoro-N-hydroxy-2,3,4,5-tetrahydro-1H-3-benzazepine-7-carboxamide
 116 2-{2-[(2,6-dimethylphenyl)amino]-2-oxoethyl}-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 117 N-hydroxy-2-[(3-methoxy-1-methyl-1H-pyrrol-2-yl)carbonyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 118 8-fluoro-N-hydroxy-2-[(3-methoxy-1-methyl-1H-pyrrol-2-yl)carbonyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 119 8-chloro-N-hydroxy-2-[(3-methoxy-1-methyl-1H-pyrrol-2-yl)carbonyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 120 2-[(4,5-dichloro-1-methyl-1H-pyrrol-2-yl)carbonyl]-N-hydroxy-4,4-dimethyl-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 121 3-[(4,5-dichloro-1-methyl-1H-pyrrol-2-yl)carbonyl]-N-hydroxy-1,2,3,4,5,6-hexahydro-3-benzazocine-9-carboxamide
 122 2-[(4,5-dichloro-1-methyl-1H-pyrrol-2-yl)carbonyl]-N-hydroxy-8-methoxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 123 2-[(1-cyclopropyl-1H-pyrrol-2-yl)carbonyl]-N-hydroxy-8-methyl-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 124 8-cyano-2-[(1-cyclopropyl-1H-pyrrol-2-yl)carbonyl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 125 2-[(1-cyclopropyl-1H-pyrrol-2-yl)carbonyl]-5-fluoro-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 126 N-hydroxy-7-methoxy-2-[(5-methoxy-1-methyl-1H-indol-2-yl)carbonyl]isoindoline-5-carboxamide
 127 7-chloro-N-hydroxy-2-[(5-methoxy-1-methyl-1H-indol-2-yl)carbonyl]isoindoline-5-carboxamide
 128 N-hydroxy-3-[(5-methoxy-1-methyl-1H-indol-2-yl)carbonyl]-2,3,4,5-tetrahydro-1H-3-benzazepine-7-carboxamide
 129 3-{[2-(4-tert-butylphenyl)-4-methyl-4H-furo[3,2-b]pyrrol-5-yl]carbonyl}-N-hydroxy-2,3,4,5-tetrahydro-1H-3-benzazepine-7-carboxamide
 130 2-{[2-(4-tert-butylphenyl)-4-methyl-4H-furo[3,2-b]pyrrol-5-yl]carbonyl}-N-hydroxy-2,3,4,5-tetrahydro-1H-2-benzazepine-7-carboxamide
 131 2-{[2-(4-tert-butylphenyl)-4-methyl-4H-furo[3,2-b]pyrrol-5-yl]carbonyl}-9-fluoro-N-hydroxy-2,3,4,5-tetrahydro-1H-2-benzazepine-7-carboxamide
 132 2-[(3-chloro-1-methyl-1H-indol-2-yl)carbonyl]-9-fluoro-N-hydroxy-2,3,4,5-tetrahydro-1H-2-benzazepine-7-carboxamide
 133 2-[(3-chloro-1-methyl-1H-indol-2-yl)carbonyl]-9-ethoxy-N-hydroxy-2,3,4,5-tetrahydro-1H-2-benzazepine-7-carboxamide
 134 3-[(3-chloro-1-methyl-1H-indol-2-yl)carbonyl]-9-fluoro-N-hydroxy-2,3,4,5-tetrahydro-1H-3-benzazepine-7-carboxamide
 135 2-[2-(4-chlorophenyl)-2-methylpropanoyl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 136 2-[2-(4-chlorophenyl)-2-methylpropanoyl]-8-fluoro-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 137 8-chloro-2-[2-(4-chlorophenyl)-2-methylpropanoyl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 138 2-(4-tert-butylbenzoyl)-N-hydroxy-4,4-dimethyl-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 139 3-(4-tert-butylbenzoyl)-N-hydroxy-1,2,3,4,5,6-hexahydro-3-benzazocine-9-carboxamide
 140 2-(4-tert-butylbenzoyl)-N-hydroxy-8-methoxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 141 2-(biphenyl-4-ylacetyl)-N-hydroxy-8-methoxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 142 2-(biphenyl-4-ylacetyl)-N-hydroxy-8-methyl-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 143 2-(biphenyl-4-ylacetyl)-8-cyano-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 144 2-(cycloheptylcarbonyl)-N-hydroxyisoindoline-5-carboxamide
 145 2-(cycloheptylcarbonyl)-N-hydroxy-7-methoxyisoindoline-5-carboxamide
 146 7-chloro-2-(cycloheptylcarbonyl)-N-hydroxyisoindoline-5-carboxamide
 147 2-[1-adamantylcarbonyl]-N-hydroxy-1,1-dimethyl-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 148 2-[1-adamantylcarbonyl]-8-chloro-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 149 N-hydroxy-2-[4-(trifluoromethyl)benzoyl]isoindoline-5-carboxamide
 150 10-fluoro-N-hydroxy-3-[4-(trifluoromethyl)benzoyl]-1,2,3,4,5,6-hexahydro-3-benzazocine-8-carboxamide
 153 2-[(4-tert-butylphenyl)sulfonyl]-8-fluoro-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 154 8-fluoro-N-hydroxy-2-[(4-methoxybiphenyl-4-yl)sulfonyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 155 2-[(4'-fluorobiphenyl-3-yl)sulfonyl]-N-hydroxy-4,4-dimethyl-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 156 N-hydroxy-4,4-dimethyl-2-(propylsulfonyl)-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 157 N-hydroxy-3-(propylsulfonyl)-1,2,3,4,5,6-hexahydro-3-benzazocine-9-carboxamide
 158 N-hydroxy-3-({5-[3-(trifluoromethyl)phenyl]-3-thienyl}sulfonyl)-1,2,3,4,5,6-hexahydro-3-benzazocine-9-carboxamide
 159 2-[(4-tert-butylphenyl)sulfonyl]-N-hydroxy-8-methoxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide

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- 160 N-hydroxy-8-methoxy-2-[(4'-methoxybiphenyl-4-yl)sulfonyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 161 2-[(4-tert-butylphenyl)sulfonyl]-N-hydroxy-8-methyl-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 162 N-hydroxy-2-[(4'-methoxybiphenyl-4-yl)sulfonyl]-8-methyl-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 164 2-[(4-tert-butylphenyl)sulfonyl]-8-chloro-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 165 8-chloro-2-[(4'-fluorobiphenyl-3-yl)sulfonyl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 166 8-cyano-2-[(4'-fluorobiphenyl-3-yl)sulfonyl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 167 8-cyano-N-hydroxy-2-(propylsulfonyl)-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 168 5-fluoro-2-[(4'-fluorobiphenyl-3-yl)sulfonyl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 169 5-fluoro-N-hydroxy-2-(propylsulfonyl)-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 170 2-[(4-tert-butylphenyl)sulfonyl]-N-hydroxyisoindoline-5-carboxamide
 171 N-hydroxy-2-(propylsulfonyl)isoindoline-5-carboxamide
 172 N-hydroxy-7-methoxy-2-[(4'-methoxybiphenyl-4-yl)sulfonyl]isoindoline-5-carboxamide
 173 N-hydroxy-7-methoxy-2-(propylsulfonyl)isoindoline-5-carboxamide
 174 7-chloro-N-hydroxy-2-[(4'-methoxybiphenyl-4-yl)sulfonyl]isoindoline-5-carboxamide
 175 7-chloro-2-[(4'-fluorobiphenyl-3-yl)sulfonyl]-N-hydroxyisoindoline-5-carboxamide
 176 N-hydroxy-3-[(4'-methoxybiphenyl-4-yl)sulfonyl]-2,3,4,5-tetrahydro-1H-3-benzazepine-7-carboxamide
 177 3-[(4'-fluorobiphenyl-3-yl)sulfonyl]-N-hydroxy-2,3,4,5-tetrahydro-1H-3-benzazepine-7-carboxamide
 178 2-[(4-tert-butylphenyl)sulfonyl]-N-hydroxy-2,3,4,5-tetrahydro-1H-2-benzazepine-7-carboxamide
 179 N-hydroxy-2-(propylsulfonyl)-2,3,4,5-tetrahydro-1H-2-benzazepine-7-carboxamide
 180 9-fluoro-2-[(4'-fluorobiphenyl-3-yl)sulfonyl]-N-hydroxy-2,3,4,5-tetrahydro-1H-2-benzazepine-7-carboxamide
 181 9-fluoro-N-hydroxy-2-(propylsulfonyl)-2,3,4,5-tetrahydro-1H-2-benzazepine-7-carboxamide
 182 9-ethoxy-N-hydroxy-2-[(4'-methoxybiphenyl-4-yl)sulfonyl]-2,3,4,5-tetrahydro-1H-2-benzazepine-7-carboxamide
 183 9-ethoxy-N-hydroxy-2-(propylsulfonyl)-2,3,4,5-tetrahydro-1H-2-benzazepine-7-carboxamide
 184 9-fluoro-N-hydroxy-3-[(4'-methoxybiphenyl-4-yl)sulfonyl]-2,3,4,5-tetrahydro-1H-3-benzazepine-7-carboxamide
 185 9-fluoro-3-[(4'-fluorobiphenyl-3-yl)sulfonyl]-N-hydroxy-2,3,4,5-tetrahydro-1H-3-benzazepine-7-carboxamide
 186 N-hydroxy-4,4-dimethyl-2-[[4-(trifluoromethyl)phenyl]sulfonyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 187 N-hydroxy-3-[[4-(trifluoromethyl)phenyl]sulfonyl]-1,2,3,4,5,6-hexahydro-3-benzazocine-9-carboxamide
 188 8-chloro-N-hydroxy-2-[[4-(trifluoromethyl)phenyl]sulfonyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 189 N-hydroxy-3-[[5-(2-methoxyphenyl)-1,2,4-oxadiazol-3-yl]methyl]-2,3,4,5-tetrahydro-1H-3-benzazepine-7-carboxamide
 190 3-[2-(4-chlorophenoxy)ethyl]-N-hydroxy-2,3,4,5-tetrahydro-1H-3-benzazepine-7-carboxamide
 191 N-hydroxy-2-[4-(trifluoromethyl)benzyl]-2,3,4,5-tetrahydro-1H-2-benzazepine-7-carboxamide
 192 N-hydroxy-2-[3-(trifluoromethoxy)benzyl]-2,3,4,5-tetrahydro-1H-2-benzazepine-7-carboxamide
 193 2-[3-(2,3-dihydro-1H-indol-1-yl)-3-oxopropyl]-9-fluoro-N-hydroxy-2,3,4,5-tetrahydro-1H-2-benzazepine-7-carboxamide
 194 9-fluoro-N-hydroxy-2-[4-(trifluoromethyl)benzyl]-2,3,4,5-tetrahydro-1H-2-benzazepine-7-carboxamide
 195 2-[3-(2,3-dihydro-1H-indol-1-yl)-3-oxopropyl]-9-ethoxy-N-hydroxy-2,3,4,5-tetrahydro-1H-2-benzazepine-7-carboxamide
 196 9-ethoxy-N-hydroxy-2-[3-(trifluoromethoxy)benzyl]-2,3,4,5-tetrahydro-1H-2-benzazepine-7-carboxamide
 197 3-[3-(2,3-dihydro-1H-indol-1-yl)-3-oxopropyl]-9-fluoro-N-hydroxy-2,3,4,5-tetrahydro-1H-3-benzazepine-7-carboxamide
 198 9-fluoro-N-hydroxy-3-[3-(trifluoromethoxy)benzyl]-2,3,4,5-tetrahydro-1H-3-benzazepine-7-carboxamide
 199 3-[2-(4-chlorophenoxy)ethyl]-9-fluoro-N-hydroxy-2,3,4,5-tetrahydro-1H-3-benzazepine-7-carboxamide
 200 2-[4-(3-chlorophenyl)-1,3-thiazol-2-yl]-N-hydroxy-4,4-dimethyl-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 201 N-hydroxy-4,4-dimethyl-2-[4-(3-methyl-1-benzothien-2-yl)-1,3-thiazol-2-yl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 202 N-hydroxy-3-[4-(4-methoxyphenyl)-1,3-thiazol-2-yl]-1,2,3,4,5,6-hexahydro-3-benzazocine-9-carboxamide
 203 3-[4-(benzylamino)pyrimidin-2-yl]-N-hydroxy-1,2,3,4,5,6-hexahydro-3-benzazocine-9-carboxamide
 204 2-[4-(3-chlorophenyl)-1,3-thiazol-2-yl]-N-hydroxy-8-methoxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 205 N-hydroxy-8-methoxy-2-[4-[(trifluoromethyl)phenyl]-1,3-thiazol-2-yl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 206 2-[4-(3-chlorophenyl)-1,3-thiazol-2-yl]-N-hydroxy-8-methyl-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 207 N-hydroxy-8-methyl-2-[4-(3-methyl-1-benzothien-2-yl)-1,3-thiazol-2-yl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 208 8-fluoro-N-hydroxy-2-[4-(4-methoxyphenyl)-1,3-thiazol-2-yl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 209 2-[4-(benzylamino)pyrimidin-2-yl]-8-fluoro-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 210 2-[2-(benzylamino)pyrimidin-4-yl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 211 N-hydroxy-2-(4-pyridin-3-yl-1,3-thiazol-2-yl)-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 212 8-chloro-2-[4-(3-chlorophenyl)-1,3-thiazol-2-yl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 213 8-chloro-N-hydroxy-2-[4-[(trifluoromethyl)phenyl]-1,3-thiazol-2-yl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 214 8-cyano-N-hydroxy-2-[4-(3-methyl-1-benzothien-2-yl)-1,3-thiazol-2-yl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 215 8-cyano-N-hydroxy-2-[4-(4-methoxyphenyl)-1,3-thiazol-2-yl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 216 2-[4-(benzylamino)pyrimidin-2-yl]-5-fluoro-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 217 2-[2-(benzylamino)pyrimidin-4-yl]-5-fluoro-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 218 N-hydroxy-2-(4-pyridin-3-yl-1,3-thiazol-2-yl)isoindoline-5-carboxamide
 219 N-hydroxy-2-[4-[(trifluoromethyl)phenyl]-1,3-thiazol-2-yl]isoindoline-5-carboxamide
 220 2-[4-(3-chlorophenyl)-1,3-thiazol-2-yl]-N-hydroxy-7-methoxyisoindoline-5-carboxamide
 221 N-hydroxy-7-methoxy-2-[4-(3-methyl-1-benzothien-2-yl)-1,3-thiazol-2-yl]isoindoline-5-carboxamide
 222 7-chloro-N-hydroxy-2-[4-(4-methoxyphenyl)-1,3-thiazol-2-yl]isoindoline-5-carboxamide
 223 2-[4-(benzylamino)pyrimidin-2-yl]-7-chloro-N-hydroxyisoindoline-5-carboxamide
 224 3-[4-(benzylamino)pyrimidin-2-yl]-N-hydroxy-2,3,4,5-tetrahydro-1H-3-benzazepine-7-carboxamide

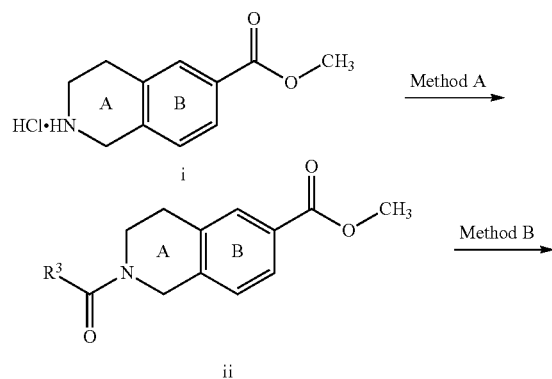
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- 225 3-[2-(benzylamino)pyrimidin-4-yl]-N-hydroxy-2,3,4,5-tetrahydro-1H-3-benzazepine-7-carboxamide
 226 N-hydroxy-2-(4-pyridin-3-yl-1,3-thiazol-2-yl)-2,3,4,5-tetrahydro-1H-2-benzazepine-7-carboxamide
 227 N-hydroxy-2-[4-[4-(trifluoromethyl)phenyl]-1,3-thiazol-2-yl]-2,3,4,5-tetrahydro-1H-2-benzazepine-7-carboxamide
 228 2-[4-(3-chlorophenyl)-1,3-thiazol-2-yl]-9-fluoro-N-hydroxy-2,3,4,5-tetrahydro-1H-2-benzazepine-7-carboxamide
 229 9-fluoro-N-hydroxy-2-[4-(3-methyl-1-benzothien-2-yl)-1,3-thiazol-2-yl]-2,3,4,5-tetrahydro-1H-2-benzazepine-7-carboxamide
 230 2-[4-(3-chlorophenyl)-1,3-thiazol-2-yl]-9-ethoxy-N-hydroxy-2,3,4,5-tetrahydro-1H-2-benzazepine-7-carboxamide
 231 9-fluoro-N-hydroxy-3-(4-pyridin-3-yl-1,3-thiazol-2-yl)-2,3,4,5-tetrahydro-1H-3-benzazepine-7-carboxamide
 232 2-(1-adamantylcarbonyl)-N-hydroxy-2,3,4,5-tetrahydro-1H-2-benzazepine-7-carboxamide
 233 N-hydroxy-2-[(1-methyl-1H-pyrazol-3-yl)carbonyl]-2,3,4,5-tetrahydro-1H-2-benzazepine-7-carboxamide
 234 N-hydroxy-2-(1-naphthoyl)-2,3,4,5-tetrahydro-1H-2-benzazepine-7-carboxamide
 235 N-hydroxy-2-(4-methoxybenzoyl)-2,3,4,5-tetrahydro-1H-2-benzazepine-7-carboxamide
 236 2-[[3,5-bis(trifluoromethyl)phenyl]acetyl]-N-hydroxy-2,3,4,5-tetrahydro-1H-2-benzazepine-7-carboxamide
 237 tert-butyl[4-(3-[[6-[(hydroxyamino)carbonyl]-3,4-dihydroisoquinolin-2(1H)-yl]carbonyl]isoxazol-5-yl)phenyl]carbamate
 238 2-(4-tert-butylbenzoyl)-N-hydroxy-2,3,4,5-tetrahydro-1H-2-benzazepine-7-carboxamide
 239 2-(1-benzothien-2-ylcarbonyl)-N-hydroxy-2,3,4,5-tetrahydro-1H-2-benzazepine-7-carboxamide
 240 2-[(5-chloro-1H-indol-2-yl)carbonyl]-N-hydroxy-2,3,4,5-tetrahydro-1H-2-benzazepine-7-carboxamide
 241 N-hydroxy-2-(2,4,6-trifluorobenzoyl)-2,3,4,5-tetrahydro-1H-2-benzazepine-7-carboxamide
 242 N-hydroxy-2-[(7-methoxy-1-benzofuran-2-yl)carbonyl]-2,3,4,5-tetrahydro-1H-2-benzazepine-7-carboxamide
 243 N-hydroxy-2-(quinoxalin-2-ylcarbonyl)-2,3,4,5-tetrahydro-1H-2-benzazepine-7-carboxamide
 244 2-(biphenyl-4-ylcarbonyl)-N-hydroxy-2,3,4,5-tetrahydro-1H-2-benzazepine-7-carboxamide
 245 N-hydroxy-2-[(5-methylisoxazol-3-yl)carbonyl]-2,3,4,5-tetrahydro-1H-2-benzazepine-7-carboxamide
 246 2-(cycloheptylcarbonyl)-N-hydroxy-2,3,4,5-tetrahydro-1H-2-benzazepine-7-carboxamide
 247 2-(cyclohexylcarbonyl)-N-hydroxy-2,3,4,5-tetrahydro-1H-2-benzazepine-7-carboxamide
 248 N-hydroxy-2-[(3-hydroxy-1-adamantyl)carbonyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 249 N-hydroxy-2-[(6-methoxy-1-benzofuran-3-yl)acetyl]-2,3,4,5-tetrahydro-1H-2-benzazepine-7-carboxamide
 250 2-(1-benzofuran-2-ylcarbonyl)-N-hydroxy-2,3,4,5-tetrahydro-1H-2-benzazepine-7-carboxamide
 251 2-[(5-chloro-1-benzothien-3-yl)acetyl]-N-hydroxy-2,3,4,5-tetrahydro-1H-2-benzazepine-7-carboxamide
 252 2-(1-benzofuran-5-ylcarbonyl)-N-hydroxy-2,3,4,5-tetrahydro-1H-2-benzazepine-7-carboxamide
 253 N-hydroxy-2-[(5-methyl-1H-indol-2-yl)carbonyl]-2,3,4,5-tetrahydro-1H-2-benzazepine-7-carboxamide
 254 2-[(2Z)-2-(acetylamino)-3-phenylprop-2-enoyl]-N-hydroxy-2,3,4,5-tetrahydro-1H-2-benzazepine-7-carboxamide
 255 N-hydroxy-2-(quinolin-3-ylcarbonyl)-2,3,4,5-tetrahydro-1H-2-benzazepine-7-carboxamide
 256 2-[3,5-bis(acetylamino)benzoyl]-N-hydroxy-2,3,4,5-tetrahydro-1H-2-benzazepine-7-carboxamide
 257 2-[(5-chloro-1-benzofuran-2-yl)carbonyl]-N-hydroxy-2,3,4,5-tetrahydro-1H-2-benzazepine-7-carboxamide
 258 2-(1-benzothien-3-ylcarbonyl)-N-hydroxy-2,3,4,5-tetrahydro-1H-2-benzazepine-7-carboxamide
 259 N-hydroxy-2-(mesitylacetyl)-2,3,4,5-tetrahydro-1H-2-benzazepine-7-carboxamide
 260 N-hydroxy-2-(2-thienylcarbonyl)-2,3,4,5-tetrahydro-1H-2-benzazepine-7-carboxamide

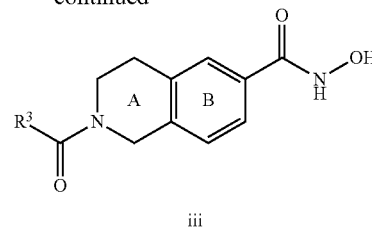
4. General Synthetic Methods and Intermediates

The compounds of the present invention can be prepared by methods known to one of ordinary skill in the art and/or by reference to the schemes shown below and the synthetic examples that follow. Exemplary synthetic routes are set forth in below, and in the Examples. One of ordinary skill in the art will appreciate that transformations shown below can also be carried out on analogous compounds containing one or more substituents on Rings A and B, or on analogous compounds with different Ring A ring sizes.

Scheme 1: General route for the synthesis of 2-acyl-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide analogs



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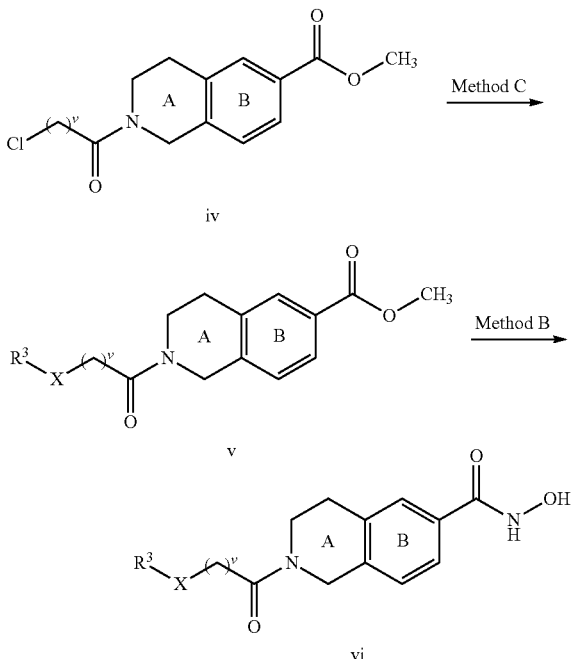


Scheme 1 shows a general route for preparing compounds of formula iii. As shown in scheme 1, methyl 1,2,3,4-tetrahydroisoquinoline-6-carboxylate hydrochloride salt i, is treated with a carboxylic acid, R^3-CO_2H , using a coupling agent in the presence of a base (Method A). Suitable coupling agents include, but are not limited to, 2-(1H-benzotriazole-1-yl)-1,1,3,3-tetramethyluronium hexafluorophosphate (HBTU), or O-(7-azabenzotriazol-1-yl)-1,1,3,3-tetramethyluronium hexafluorophosphate (HATU). Suitable bases for Method A include, but are not limited to, triethylamine, N,N'-diisopropylethylamine and N-methylmorpholine. Suitable solvents for Method A include, but are not limited to, dichloromethane (DCM), tetrahydrofuran (THF), N,N'-dimethylformamide (DMF), N-methylpyrrolidone (NMP) or N,N'-dimethylacetamide. Conversion of ii to the corresponding hydroxamate iii is achieved by heating ii in the presence of hydroxylamine hydrochloride and potassium hydroxide in an appropriate solvent such as methanol (Method B). Conversion to the corresponding hydroxamate can also be

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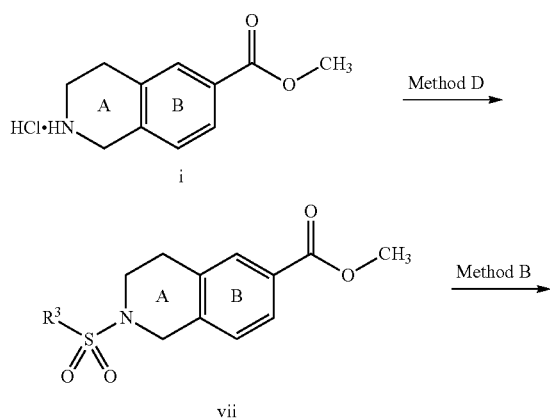
achieved using the potassium salt of hydroxylamine (Huang et al., *J. Med. Chem.* 2009, 52(21):675).

Scheme 2: General route for the synthesis of N-hydroxy-2-(2 or 3-substituted-acetyl)-1,2,3,4-tetrahydroisoquinoline-6-carboxamide analogs



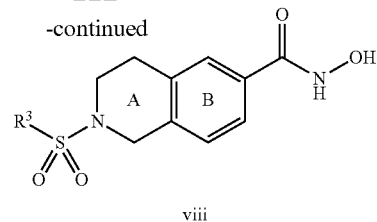
Scheme 2 shows a general route for preparing compounds of formula vi. Amides of formula iv, where v is 1-2, are prepared by Method A, using either chloroacetic acid or 3-chloropropionic acid, and are then reacted with oxygen (R^3-OH) or nitrogen nucleophiles (R^3-NH_2) in a solvent such as CH_2Cl_2 or DMF, in the presence of a base, such as N,N'-diisopropylethylamine (Method C; see Takikawa et al., *Organic Lett.* 2007, 9(14):2713-2716; Slee et al., *J. Med. Chem.* 2008, 51(6):1730-1739) to give compounds of formula v where X is $-O-$ or $-NH-$. Subsequent conversion of compounds of formula v to the corresponding hydroxamates vi is carried out as described in Scheme 1 using Method B.

Scheme 3: General route for the synthesis of N-hydroxy 2-(substituted sulfonyl)-1,2,3,4-tetrahydroisoquinoline-6-carboxamide analogs



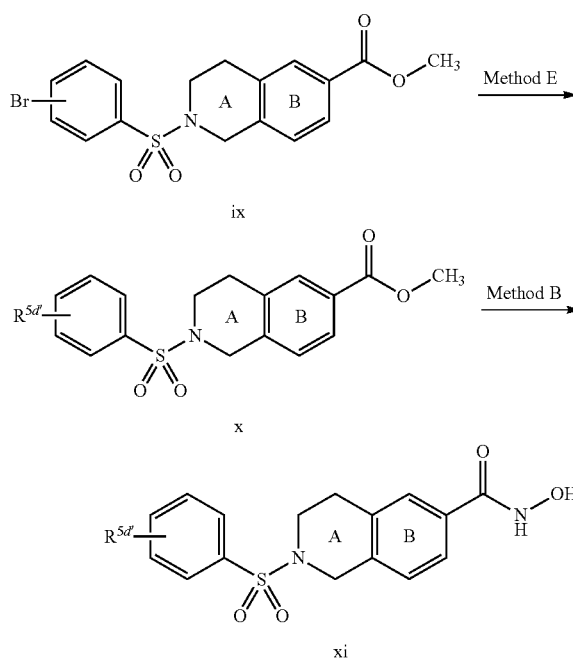
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Scheme 3 shows a general route for preparing compounds of formula v. As shown in Scheme 2, methyl 1,2,3,4-tetrahydroisoquinoline-6-carboxylate hydrochloride salt i is treated with appropriate sulfonyl chloride, R^3-SO_2Cl , and DMAP in DMF at ambient temperature (Method D). Method D may also be carried out in a solvent such as DCM or N,N'-dimethylacetamide. Subsequent conversion of the resulting compounds of formula vii to the corresponding hydroxamates viii is carried out as described in Scheme 1 using Method B.

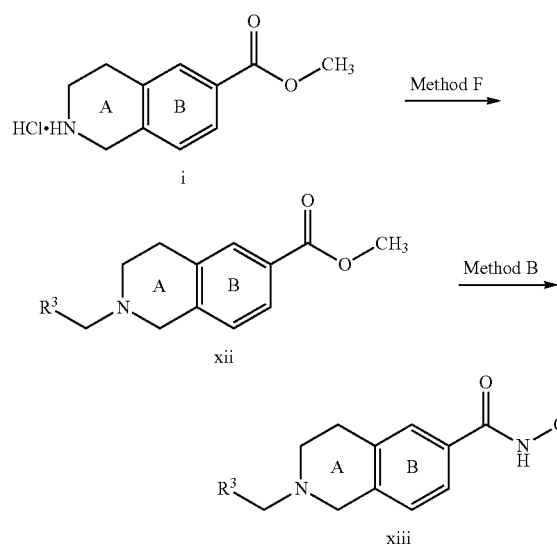
Scheme 4: General synthesis of N-hydroxy-2-(substituted-phenylsulfonyl)-1,2,3,4-tetrahydroisoquinoline-6-carboxamide analogs



Scheme 4 shows a general route for preparing compounds of formula xi. Sulfonamides of formula ix bearing a pendant aromatic bromide (or other halide) can be prepared as described in Method D, and are then subjected to a Suzuki coupling with a boronic acid, $R^{5d'}-B(OH)_2$, in the presence of a Pd-catalyst such as $Pd(PPh_3)_4$, and a base such as Na_2CO_3 (see Weinstein et al, *Bioorg. Med. Chem. Lett.* 2005 15(5): 1435-1440) to afford sulfonamides of formula x. Other Pd-mediated coupling conditions such as the reaction of an organo-stannane compound with an aromatic halide, or reaction with amines in a Buchwald-Hartwig type coupling may be employed to generate compounds of formula x where $R^{5d'}$ is for example an aromatic ring, a heteroaromatic ring or an amine containing moiety. Subsequent conversion of compounds of formula x to the corresponding hydroxamates of formula xi is carried out as described in Scheme 1 using Method B.

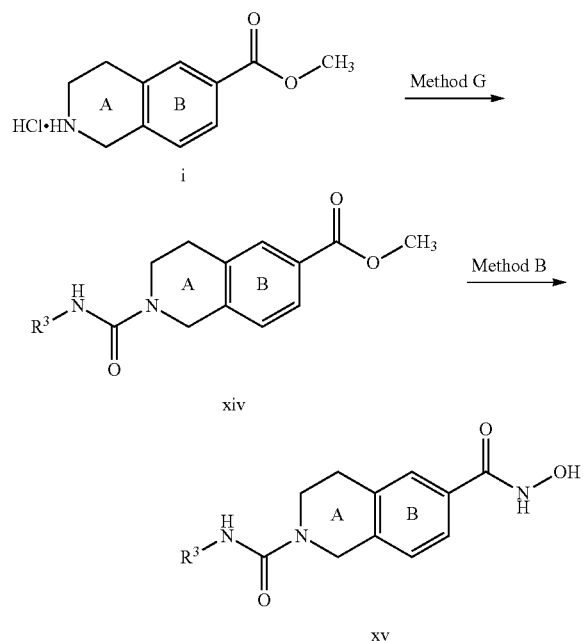
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Scheme 5: General route for the synthesis of 2-substituted-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide analogs



Scheme 5 shows a general route for preparing compounds of formula xiii. As shown in Scheme 5, methyl 1,2,3,4-tetrahydroisoquinoline-6-carboxylate hydrochloride salt i is treated with an appropriate alkyl halide (R^3-CH_2-Br or R^3-CH_2-Cl), in the presence of a suitable base such as Et_3N in a solvent such as DMF (Method F) to afford compounds of formula xii. Alternatively, a reductive alkylation with an aldehyde in the presence of a reducing agent can be used to generate compounds of formula xii. Subsequent conversion of compounds of formula xii to the corresponding hydroxamate xiii is carried out as described in Scheme 1 (Method B).

Scheme 6: General route for the synthesis of 2-urea substituted-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide analogs

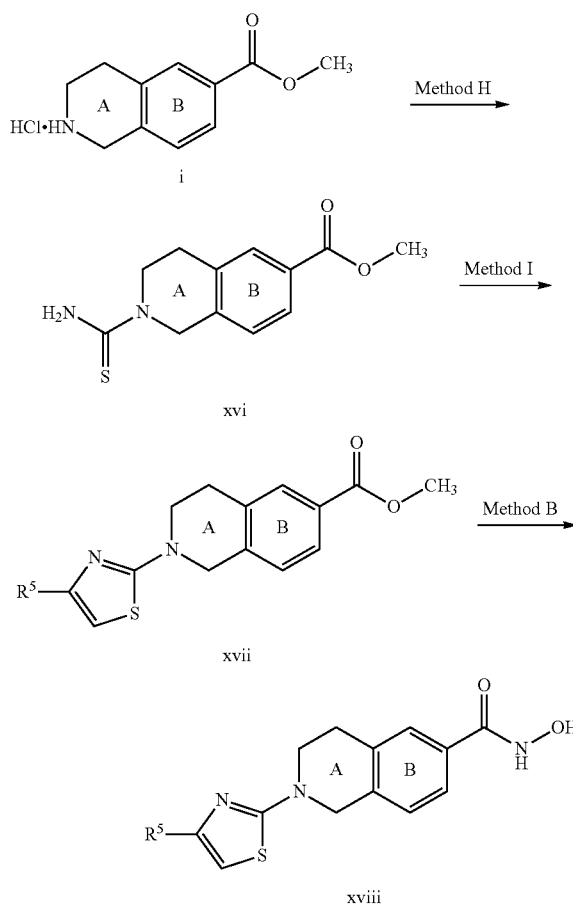


Scheme 6 shows a general route for preparing compounds of formula xv. As shown in Scheme 6, a solution of methyl

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1,2,3,4-tetrahydroisoquinoline-6-carboxylate hydrochloride salt i, and optionally a base in a solvent is treated with an isocyanate (R^3-NCO), at ambient or elevated temperature to afford compounds of formula xiv (Method G). Suitable bases for Method G include, but are not limited to triethylamine, N,N'-diisopropylethylamine and N-methylmorpholine. Suitable solvents for Method G include but are not limited to, DCM, THF, DMF, NMP and N,N'-dimethylacetamide. Subsequent conversion of compounds of formula xiv to the corresponding hydroxamates of formula xv is carried out as described in Scheme 1 using Method B

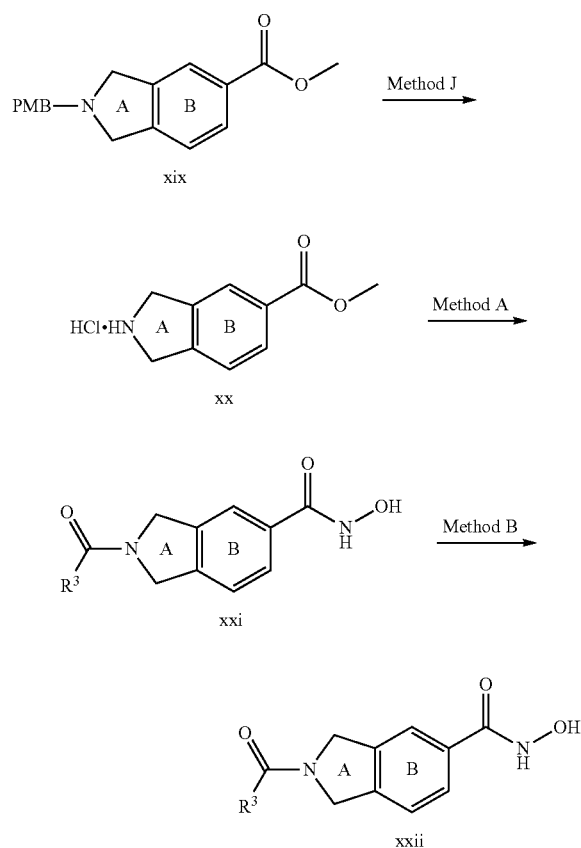
Scheme 7: General route for the synthesis of 2-thiazole-substituted-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide analogs



Scheme 7 shows a general route for preparing compounds of formula xviii. As shown in Scheme 7, methyl 1,2,3,4-tetrahydroisoquinoline-6-carboxylate hydrochloride salt i is treated with ammonium thiocyanate in a solvent such as THF at an elevated temperature (Method H). Cyclization of the resulting thiourea xvi to the aminothiazole xvii is accomplished upon treatment with an α -haloketone, (for example; $R^5-C(O)-CH_2Cl$) in a solvent such as 1,4-dioxane at ambient or elevated temperature (Method I). Subsequent conversion of compounds of formula xvii to the corresponding hydroxamates of formula xviii is carried out as described in Scheme 1 using Method B.

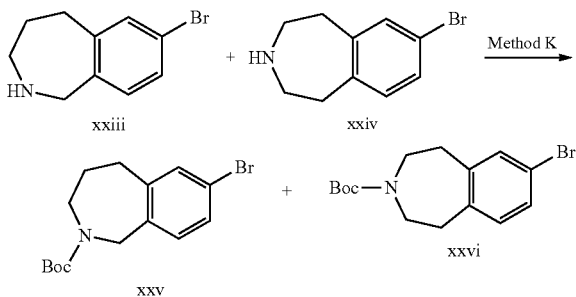
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Scheme 8: General route for the synthesis of 2-substituted-N-hydroxy-2,3-dihydro-1H-isoindole-5-carboxamide analogs



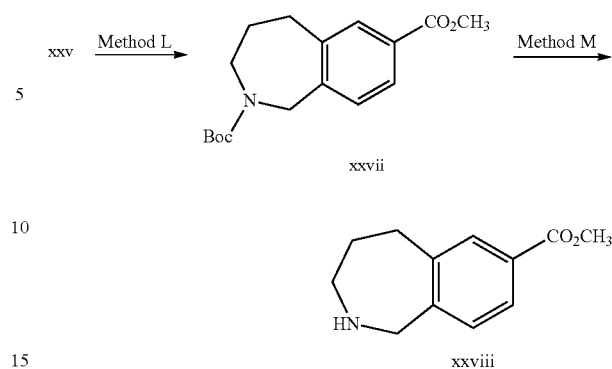
Scheme 8 shows a general route for preparing compounds of formula xxii. As shown in Scheme 8, compound xix (prepared as described in PCT Int. Appl. Pub. WO 08/044,034) is deprotected under an H₂ atmosphere in the presence of a catalyst such as Pd(OH)₂ in methanol (Method J). The compound of formula xx can then be acylated employing Method A followed by formation of the hydroxamate xxii (Method B) as shown above in Scheme 1. It will be appreciated that analogous transformations to those described in Schemes 2-7 above can be achieved starting from the compound of formula xx.

Scheme 9: Synthesis of methyl 2,3,4,5-tetrahydro-1H-benzo[c]azepine-7-carboxylate and methyl 2,3,4,5-tetrahydro-1H-benzo[d]azepine-7-carboxylate



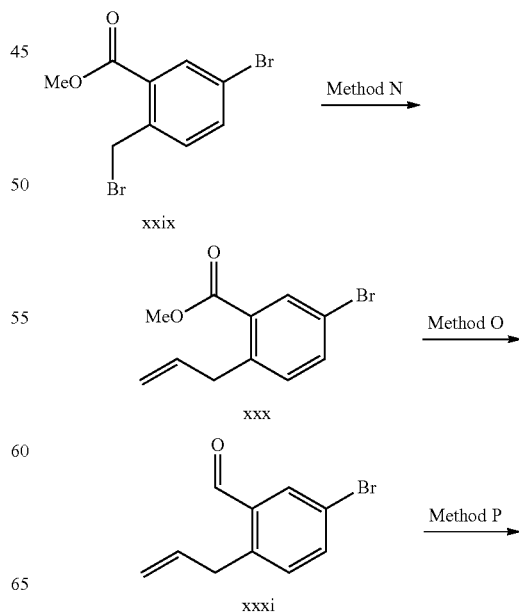
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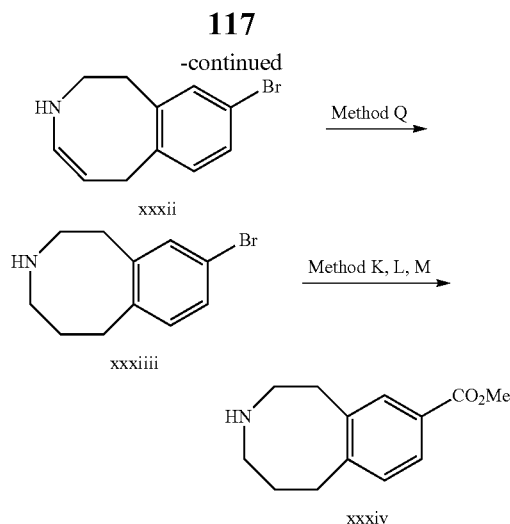
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Scheme 9 shows a general route for the preparation of compound xxviii. The two regiomer compounds xxiii, 7-bromo-2,3,4,5-tetrahydro-1H-benzo[c]azepine, and xxiv, 7-bromo-2,3,4,5-tetrahydro-1H-benzo[d]azepine, can be prepared as described in PCT Int. Appl. Pub. WO 08/076,954 as an inseparable mixture. Protection of the secondary amine with Boc-anhydride, (Method K; see Wang et al., *J. Med. Chem.* 2007, 50(2):199-210) allows for the separation of the isomers which can then be manipulated independently. Carbonylation of the aryl bromide xxv employing carbon monoxide in the presence of a Pd catalyst, as described in PCT Int. Appl. Pub. WO 05/037214 (Method L) to give the compound xxvii, which, upon subsequent removal of the Boc-protecting group (Method M) under acidic conditions yields the compound xxviii. In a similar fashion, the isomer xxvi can be elaborated to afford methyl 2,3,4,5-tetrahydro-1H-benzo[d]azepine-7-carboxylate. It will be appreciated that analogous transformations to those described in Schemes 1-7 above can be achieved starting from the compound of formula xxviii or the isomeric compound derived from compound xxvi.

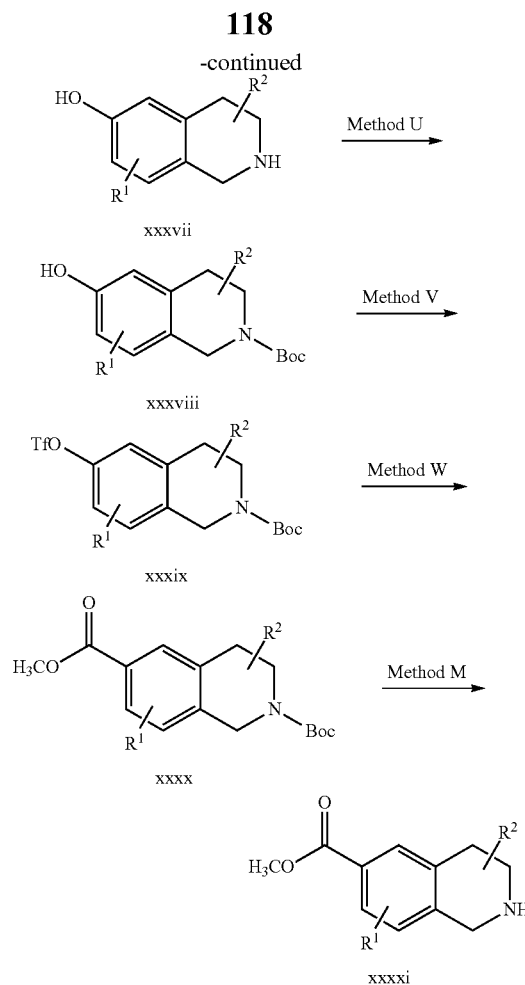
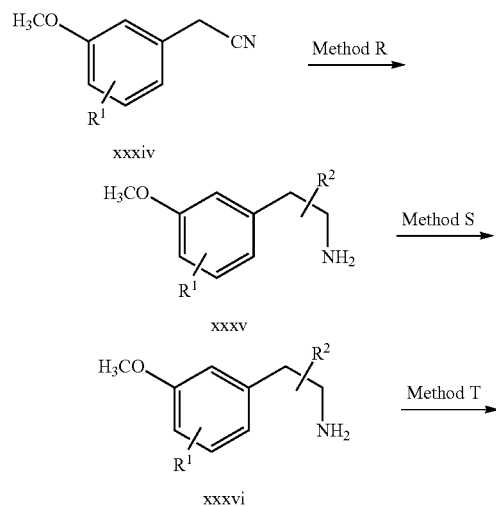
Scheme 10: Synthesis of methyl 1,2,3,4,5,6-hexahydrobenzo[d]azocine-9-carboxylate





Scheme 10 above shows a general route for the preparation of the compound of formula xxxiv. Methyl 5-bromo-2-(bromomethyl)benzoate xxix (commercially available) is converted to the compound of formula xxx by a palladium catalyzed reaction with a vinylstannane (Method N; see Crawforth et al., *Tetrahedron Lett.* 2004, 45(3): 461-465). Reduction of the methyl ester to give the compound of formula xxxi (Method O) is carried out using a suitable reducing agent such as diisobutylaluminum hydride. The compound of formula xxxi is then synthesized by a reductive amination followed by ring closing metathesis (Method P; see van Otterlo et al., *Synlett* 2003, (12): 1859-1861). A chemoselective reduction of the double bond is performed using a mild reducing agent such as diimide (Method Q, see Smit et al., *J. Org. Chem.* 2008, 73(23): 9482-9485) to give the compound of formula xxxiii. Conversion to the compound of formula xxxiv can be performed as described previously in Scheme 9 (Methods K, L, M). It will be appreciated that analogous transformations to those described in Schemes 1-7 above can then be achieved starting from the compound of formula xxxiv.

Scheme 11: General synthetic route for the preparation of substituted methyl 1,2,3,4-tetrahydroisoquinoline-7-carboxylate



Scheme 11 shows a general route for preparing compounds of formula xxxxi. The tetrahydroisoquinoline xxxvi can be prepared via a Pictet-Spengler cyclization (Method S) (as described by Nakamura et al., *Organic Letters* 2003, 5(12), 2087-2090; Kazmierski et al., *J. Org. Chem.* 1994, 59(7), 1789-95) of either a commercially available amine xxxv or one derived from the alkylation of 4-methoxy acetonitrile xxxiv (Method R) based on the nature of R^1 and R^2 (as described in Kendall et al., *Bioorg. Med. Chem.* 2007, 15(24), 7677-7687). Demethylation of xxxvi can be accomplished with BBr_3 (Method T) and the nitrogen can be protected with a protecting group such as Boc (Method U) to give compounds of formula xxxviii. Treatment of xxxviii with Tf_2O provides xxxix (Method V) which is then carbonylated with CO in the presence of Pd catalyst (Method W) as described by Micheli et al., *J. Med. Chem.* 2007, 50(21), 5076-5089. Removal of the Boc protecting group under acidic conditions (Method M) affords xxxxi which can further be functionalized as exemplified using methods illustrated in Schemes 1-7.

5. Uses, Formulation and Administration

As discussed above, the present invention provides compounds and pharmaceutical compositions that are useful as inhibitors of HDAC enzymes, particularly HDAC6, and thus the present compounds are useful for treating proliferative, inflammatory, infectious, neurological or cardiovascular disorders.

In some embodiments, the invention provides the compound of formula (I), or a pharmaceutically acceptable salt

thereof, for use in treating a proliferative disorder. In some embodiments, the invention provides a pharmaceutical composition for the treatment of a proliferative disorder comprising the compound of formula (I), or a pharmaceutically acceptable salt thereof. In some embodiments, the invention provides the use of the compound of formula (I), or a pharmaceutically acceptable salt thereof, for the preparation of a pharmaceutical composition for the treatment of a proliferative disorder. In some embodiments, the invention provides the use of an effective amount of the compound of formula (I), or a pharmaceutically acceptable salt thereof, for the treatment of a proliferative disorder.

The compounds and pharmaceutical compositions of the invention are particularly useful for the treatment of cancer. As used herein, the term "cancer" refers to a cellular disorder characterized by uncontrolled or dysregulated cell proliferation, decreased cellular differentiation, inappropriate ability to invade surrounding tissue, and/or ability to establish new growth at ectopic sites. The term "cancer" includes, but is not limited to, solid tumors and bloodborne tumors. The term "cancer" encompasses diseases of skin, tissues, organs, bone, cartilage, blood, and vessels. The term "cancer" further encompasses primary and metastatic cancers.

Non-limiting examples of solid tumors that can be treated with the disclosed inhibitors include pancreatic cancer; bladder cancer; colorectal cancer; breast cancer, including metastatic breast cancer; prostate cancer, including androgen-dependent and androgen-independent prostate cancer; renal cancer, including, e.g., metastatic renal cell carcinoma; hepatocellular cancer; lung cancer, including, e.g., non-small cell lung cancer (NSCLC), bronchioloalveolar carcinoma (BAC), and adenocarcinoma of the lung; ovarian cancer, including, e.g., progressive epithelial or primary peritoneal cancer; cervical cancer; gastric cancer; esophageal cancer; head and neck cancer, including, e.g., squamous cell carcinoma of the head and neck; melanoma; neuroendocrine cancer, including metastatic neuroendocrine tumors; brain tumors, including, e.g., glioma, anaplastic oligodendroglioma, adult glioblastoma multiforme, and adult anaplastic astrocytoma; bone cancer; and soft tissue sarcoma.

Non-limiting examples of hematologic malignancies that can be treated with the disclosed inhibitors include acute myeloid leukemia (AML); chronic myelogenous leukemia (CML), including accelerated CML and CML blast phase (CML-BP); acute lymphoblastic leukemia (ALL); chronic lymphocytic leukemia (CLL); Hodgkin's disease (HD); non-Hodgkin's lymphoma (NHL), including follicular lymphoma and mantle cell lymphoma; B-cell lymphoma; T-cell lymphoma; multiple myeloma (MM); Waldenstrom's macroglobulinemia; myelodysplastic syndromes (MDS), including refractory anemia (RA), refractory anemia with ringed sideroblasts (RARS), (refractory anemia with excess blasts (RAEB), and RAEB in transformation (RAEB-T); and myeloproliferative syndromes.

In some embodiments, compounds of the invention are suitable for the treatment of breast cancer, lung cancer, ovarian cancer, multiple myeloma, acute myeloid leukemia or acute lymphoblastic leukemia.

In other embodiments, compounds of the invention are suitable for the treatment of inflammatory and cardiovascular disorders including, but not limited to, allergies/anaphylaxis, acute and chronic inflammation, rheumatoid arthritis; autoimmune disorders, thrombosis, hypertension, cardiac hypertrophy, and heart failure.

Accordingly, in another aspect of the present invention, pharmaceutical compositions are provided, wherein these compositions comprise any of the compounds as described

herein, and optionally comprise a pharmaceutically acceptable carrier, adjuvant or vehicle. In certain embodiments, these compositions optionally further comprise one or more additional therapeutic agents.

It will also be appreciated that certain of the compounds of present invention can exist in free form for treatment, or where appropriate, as a pharmaceutically acceptable derivative thereof. According to the present invention, a pharmaceutically acceptable derivative includes, but is not limited to, pharmaceutically acceptable prodrugs, salts, esters, salts of such esters, or any other adduct or derivative which upon administration to a patient in need is capable of providing, directly or indirectly, a compound as otherwise described herein, or a metabolite or residue thereof.

As used herein, the term "pharmaceutically acceptable salt" refers to those salts which are, within the scope of sound medical judgement, suitable for use in contact with the tissues of humans and lower animals without undue toxicity, irritation, allergic response and the like, and are commensurate with a reasonable benefit/risk ratio. A "pharmaceutically acceptable salt" means any non-toxic salt or salt of an ester of a compound of this invention that, upon administration to a recipient, is capable of providing, either directly or indirectly, a compound of this invention or an inhibitorily active metabolite or residue thereof. As used herein, the term "inhibitorily active metabolite or residue thereof" means that a metabolite or residue thereof is also an inhibitor of HDAC6.

Pharmaceutically acceptable salts are well known in the art. For example, S. M. Berge et al., describe pharmaceutically acceptable salts in detail in *J. Pharmaceutical Sciences*, 1977, 66, 1-19, incorporated herein by reference. Pharmaceutically acceptable salts of the compounds of this invention include those derived from suitable inorganic and organic acids and bases. Examples of pharmaceutically acceptable, nontoxic acid addition salts are salts of an amino group formed with inorganic acids such as hydrochloric acid, hydrobromic acid, phosphoric acid, sulfuric acid and perchloric acid or with organic acids such as acetic acid, oxalic acid, maleic acid, tartaric acid, citric acid, succinic acid or malonic acid or by using other methods used in the art such as ion exchange. Other pharmaceutically acceptable salts include adipate, alginate, ascorbate, aspartate, benzenesulfonate, benzoate, bisulfate, borate, butyrate, camphorate, camphorsulfonate, citrate, cyclopentanepropionate, digluconate, dodecylsulfate, ethanesulfonate, formate, fumarate, glucoheptonate, glycerophosphate, gluconate, hemisulfate, heptanoate, hexanoate, hydroiodide, 2-hydroxy-ethanesulfonate, lactobionate, lactate, laurate, lauryl sulfate, malate, maleate, malonate, methanesulfonate, 2-naphthalenesulfonate, nicotinate, nitrate, oleate, oxalate, palmitate, pamoate, pectinate, persulfate, 3-phenylpropionate, phosphate, picrate, pivalate, propionate, stearate, succinate, sulfate, tartrate, thiocyanate, p-toluenesulfonate, undecanoate, valerate salts, and the like. Salts derived from appropriate bases include alkali metal, alkaline earth metal, ammonium and $N^+(C_{1-4}alkyl)_4$ salts. This invention also envisions the quaternization of any basic nitrogen-containing groups of the compounds disclosed herein. Water or oil-soluble or dispersible products may be obtained by such quaternization. Representative alkali or alkaline earth metal salts include sodium, lithium, potassium, calcium, magnesium, and the like. Further pharmaceutically acceptable salts include, when appropriate, nontoxic ammonium, quaternary ammonium, and amine cations formed using counterions such as halide, hydroxide, carboxylate, sulfate, phosphate, nitrate, loweralkyl sulfonate and aryl sulfonate.

As described above, the pharmaceutically acceptable compositions of the present invention additionally comprise a pharmaceutically acceptable carrier, adjuvant, or vehicle, which, as used herein, includes any and all solvents, diluents, or other liquid vehicle, dispersion or suspension aids, surface active agents, isotonic agents, thickening or emulsifying agents, preservatives, solid binders, lubricants and the like, as suited to the particular dosage form desired. Remington's Pharmaceutical Sciences, Sixteenth Edition, E. W. Martin (Mack Publishing Co., Easton, Pa., 1980) discloses various carriers used in formulating pharmaceutically acceptable compositions and known techniques for the preparation thereof. Except insofar as any conventional carrier medium is incompatible with the compounds of the invention, such as by producing any undesirable biological effect or otherwise interacting in a deleterious manner with any other component(s) of the pharmaceutically acceptable composition, its use is contemplated to be within the scope of this invention. Some examples of materials which can serve as pharmaceutically acceptable carriers include, but are not limited to, ion exchangers, alumina, aluminum stearate, lecithin, serum proteins, such as human serum albumin, buffer substances such as phosphates, glycine, sorbic acid, or potassium sorbate, partial glyceride mixtures of saturated vegetable fatty acids, water, salts or electrolytes, such as protamine sulfate, disodium hydrogen phosphate, potassium hydrogen phosphate, sodium chloride, zinc salts, colloidal silica, magnesium trisilicate, polyvinyl pyrrolidone, polyacrylates, waxes, polyethylene-polyoxypropylene-block polymers, wool fat, sugars such as lactose, glucose and sucrose; starches such as corn starch and potato starch; cellulose and its derivatives such as sodium carboxymethyl cellulose, ethyl cellulose and cellulose acetate; powdered tragacanth; malt; gelatin; talc; excipients such as cocoa butter and suppository waxes; oils such as peanut oil, cottonseed oil; safflower oil; sesame oil; olive oil; corn oil and soybean oil; glycols; such as propylene glycol or polyethylene glycol; esters such as ethyl oleate and ethyl laurate; agar; buffering agents such as magnesium hydroxide and aluminum hydroxide; alginic acid; pyrogen-free water; isotonic saline; Ringer's solution; ethyl alcohol, and phosphate buffer solutions, as well as other non-toxic compatible lubricants such as sodium lauryl sulfate and magnesium stearate, as well as coloring agents, releasing agents, coating agents, sweetening, flavoring and perfuming agents, preservatives and antioxidants can also be present in the composition, according to the judgment of the formulator.

In yet another aspect, a method for treating a proliferative, inflammatory, infectious, neurological or cardiovascular disorder is provided comprising administering an effective amount of a compound, or a pharmaceutical composition to a subject in need thereof. In certain embodiments of the present invention an "effective amount" of the compound or pharmaceutical composition is that amount effective for treating a proliferative, inflammatory, infectious, neurological or cardiovascular disorder, or is that amount effective for treating cancer. In other embodiments, an "effective amount" of a compound is an amount which inhibits binding of HDAC6, and thereby blocks the resulting signaling cascades that lead to the abnormal activity of growth factors, receptor tyrosine kinases, protein serine/threonine kinases, G protein coupled receptors and phospholipid kinases and phosphatases.

The compounds and compositions, according to the method of the present invention, may be administered using any amount and any route of administration effective for treating the disease. The exact amount required will vary from subject to subject, depending on the species, age, and general condition of the subject, the severity of the infection, the

particular agent, its mode of administration, and the like. The compounds of the invention are preferably formulated in dosage unit form for ease of administration and uniformity of dosage. The expression "dosage unit form" as used herein refers to a physically discrete unit of agent appropriate for the patient to be treated. It will be understood, however, that the total daily usage of the compounds and compositions of the present invention will be decided by the attending physician within the scope of sound medical judgment. The specific effective dose level for any particular patient or organism will depend upon a variety of factors including the disease being treated and the severity of the disease; the activity of the specific compound employed; the specific composition employed; the age, body weight, general health, sex and diet of the patient; the time of administration, route of administration, and rate of excretion of the specific compound employed; the duration of the treatment; drugs used in combination or coincidental with the specific compound employed, and like factors well known in the medical arts. The term "patient", as used herein, means an animal, preferably a mammal, and most preferably a human.

The pharmaceutically acceptable compositions of this invention can be administered to humans and other animals orally, rectally, parenterally, intracisternally, intravaginally, intraperitoneally, topically (as by powders, ointments, or drops), buccally, as an oral or nasal spray, or the like, depending on the severity of the infection being treated. In certain embodiments, the compounds of the invention may be administered orally or parenterally at dosage levels of about 0.01 mg/kg to about 50 mg/kg and preferably from about 1 mg/kg to about 25 mg/kg, of subject body weight per day, one or more times a day, to obtain the desired therapeutic effect.

Liquid dosage forms for oral administration include, but are not limited to, pharmaceutically acceptable emulsions, microemulsions, solutions, suspensions, syrups and elixirs. In addition to the active compounds, the liquid dosage forms may contain inert diluents commonly used in the art such as, for example, water or other solvents, solubilizing agents and emulsifiers such as ethyl alcohol, isopropyl alcohol, ethyl carbonate, ethyl acetate, benzyl alcohol, benzyl benzoate, propylene glycol, 1,3-butylene glycol, dimethylformamide, oils (in particular, cottonseed, groundnut, corn, germ, olive, castor, and sesame oils), glycerol, tetrahydrofurfuryl alcohol, polyethylene glycols and fatty acid esters of sorbitan, and mixtures thereof. Besides inert diluents, the oral compositions can also include adjuvants such as wetting agents, emulsifying and suspending agents, sweetening, flavoring, and perfuming agents.

Injectable preparations, for example, sterile injectable aqueous or oleaginous suspensions may be formulated according to the known art using suitable dispersing or wetting agents and suspending agents. The sterile injectable preparation may also be a sterile injectable solution, suspension or emulsion in a nontoxic parenterally acceptable diluent or solvent, for example, as a solution in 1,3-butanediol. Among the acceptable vehicles and solvents that may be employed are water, Ringer's solution, U.S.P. and isotonic sodium chloride solution. In addition, sterile, fixed oils are conventionally employed as a solvent or suspending medium. For this purpose any bland fixed oil can be employed including synthetic mono- or diglycerides. In addition, fatty acids such as oleic acid are used in the preparation of injectables.

The injectable formulations can be sterilized, for example, by filtration through a bacterial-retaining filter, or by incorporating sterilizing agents in the form of sterile solid compositions which can be dissolved or dispersed in sterile water or other sterile injectable medium prior to use.

In order to prolong the effect of a compound of the present invention, it is often desirable to slow the absorption of the compound from subcutaneous or intramuscular injection. This may be accomplished by the use of a liquid suspension of crystalline or amorphous material with poor water solubility. The rate of absorption of the compound then depends upon its rate of dissolution that, in turn, may depend upon crystal size and crystalline form. Alternatively, delayed absorption of a parenterally administered compound form is accomplished by dissolving or suspending the compound in an oil vehicle. Injectable depot forms are made by forming microcapsule matrices of the compound in biodegradable polymers such as polylactide-polyglycolide. Depending upon the ratio of compound to polymer and the nature of the particular polymer employed, the rate of compound release can be controlled. Examples of other biodegradable polymers include poly(orthoesters) and poly(anhydrides). Depot injectable formulations are also prepared by entrapping the compound in liposomes or microemulsions that are compatible with body tissues.

Compositions for rectal or vaginal administration are preferably suppositories which can be prepared by mixing the compounds of this invention with suitable non-irritating excipients or carriers such as cocoa butter, polyethylene glycol or a suppository wax which are solid at ambient temperature but liquid at body temperature and therefore melt in the rectum or vaginal cavity and release the active compound.

Solid dosage forms for oral administration include capsules, tablets, pills, powders, and granules. In such solid dosage forms, the active compound is mixed with at least one inert, pharmaceutically acceptable excipient or carrier such as sodium citrate or dicalcium phosphate and/or a) fillers or extenders such as starches, lactose, sucrose, glucose, mannitol, and silicic acid, b) binders such as, for example, carboxymethylcellulose, alginates, gelatin, polyvinylpyrrolidone, sucrose, and acacia, c) humectants such as glycerol, d) disintegrating agents such as agar-agar, calcium carbonate, potato or tapioca starch, alginic acid, certain silicates, and sodium carbonate, e) solution retarding agents such as paraffin, f) absorption accelerators such as quaternary ammonium compounds, g) wetting agents such as, for example, cetyl alcohol and glycerol monostearate, h) absorbents such as kaolin and bentonite clay, and i) lubricants such as talc, calcium stearate, magnesium stearate, solid polyethylene glycols, sodium lauryl sulfate, and mixtures thereof. In the case of capsules, tablets and pills, the dosage form may also comprise buffering agents.

Solid compositions of a similar type may also be employed as fillers in soft and hard-filled gelatin capsules using such excipients as lactose or milk sugar as well as high molecular weight polyethylene glycols and the like. The solid dosage forms of tablets, dragees, capsules, pills, and granules can be prepared with coatings and shells such as enteric coatings and other coatings well known in the pharmaceutical formulating art. They may optionally contain opacifying agents and can also be of a composition that they release the active ingredient(s) only, or preferentially, in a certain part of the intestinal tract, optionally, in a delayed manner. Examples of embedding compositions that can be used include polymeric substances and waxes. Solid compositions of a similar type may also be employed as fillers in soft and hard-filled gelatin capsules using such excipients as lactose or milk sugar as well as high molecular weight polyethylene glycols and the like.

The active compounds can also be in micro-encapsulated form with one or more excipients as noted above. The solid dosage forms of tablets, dragees, capsules, pills, and granules can be prepared with coatings and shells such as enteric

coatings, release controlling coatings and other coatings well known in the pharmaceutical formulating art. In such solid dosage forms the active compound may be admixed with at least one inert diluent such as sucrose, lactose or starch. Such dosage forms may also comprise, as is normal practice, additional substances other than inert diluents, e.g., tableting lubricants and other tableting aids such as magnesium stearate and microcrystalline cellulose. In the case of capsules, tablets and pills, the dosage forms may also comprise buffering agents. They may optionally contain opacifying agents and can also be of a composition that they release the active ingredient(s) only, or preferentially, in a certain part of the intestinal tract, optionally, in a delayed manner. Examples of embedding compositions that can be used include polymeric substances and waxes.

Dosage forms for topical or transdermal administration of a compound of this invention include ointments, pastes, creams, lotions, gels, powders, solutions, sprays, inhalants or patches. The active component is admixed under sterile conditions with a pharmaceutically acceptable carrier and any needed preservatives or buffers as may be required. Ophthalmic formulation, ear drops, and eye drops are also contemplated as being within the scope of this invention. Additionally, the present invention contemplates the use of transdermal patches, which have the added advantage of providing controlled delivery of a compound to the body. Such dosage forms can be made by dissolving or dispersing the compound in the proper medium. Absorption enhancers can also be used to increase the flux of the compound across the skin. The rate can be controlled by either providing a rate controlling membrane or by dispersing the compound in a polymer matrix or gel.

In some embodiments, a compound of formula (I) or a pharmaceutical composition thereof is administered in conjunction with an anticancer agent. As used herein, the term "anticancer agent" refers to any agent that is administered to a subject with cancer for purposes of treating the cancer. Combination therapy includes administration of the therapeutic agents concurrently or sequentially. Alternatively, the therapeutic agents can be combined into one composition which is administered to the patient.

Non-limiting examples of DNA damaging chemotherapeutic agents include topoisomerase I inhibitors (e.g., irinotecan, topotecan, camptothecin and analogs or metabolites thereof, and doxorubicin); topoisomerase II inhibitors (e.g., etoposide, teniposide, and daunorubicin); alkylating agents (e.g., melphalan, chlorambucil, busulfan, thiopeta, ifosfamide, carmustine, lomustine, semustine, streptozocin, decarbazine, methotrexate, mitomycin C, and cyclophosphamide); DNA intercalators (e.g., cisplatin, oxaliplatin, and carboplatin); DNA intercalators and free radical generators such as bleomycin; and nucleoside mimetics (e.g., 5-fluorouracil, capecitabine, gemcitabine, fludarabine, cytarabine, mercaptopurine, thioguanine, pentostatin, and hydroxyurea).

Chemotherapeutic agents that disrupt cell replication include: paclitaxel, docetaxel, and related analogs; vincristine, vinblastin, and related analogs; thalidomide, lenalidomide, and related analogs (e.g., CC-5013 and CC-4047); protein tyrosine kinase inhibitors (e.g., imatinib mesylate and gefitinib); proteasome inhibitors (e.g., bortezomib); NF- κ B inhibitors, including inhibitors of I κ B kinase; antibodies which bind to proteins overexpressed in cancers and thereby downregulate cell replication (e.g., trastuzumab, rituximab, cetuximab, and bevacizumab); and other inhibitors of proteins or enzymes known to be upregulated, over-expressed or activated in cancers, the inhibition of which down-regulates

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cell replication. In certain embodiments, a compound of the invention is administered in conjunction with a proteasome inhibitor.

Another aspect of the invention relates to inhibiting HDAC6, activity in a biological sample or a patient, which method comprises administering to the patient, or contacting said biological sample with a compound of formula (I), or a composition comprising said compound. The term "biological sample", as used herein, generally includes in vivo, in vitro, and ex vivo materials, and also includes, without limitation, cell cultures or extracts thereof; biopsied material obtained from a mammal or extracts thereof; and blood, saliva, urine, feces, semen, tears, or other body fluids or extracts thereof.

Still another aspect of this invention is to provide a kit comprising separate containers in a single package, wherein the inventive pharmaceutical compounds, compositions and/or salts thereof are used in combination with pharmaceutically acceptable carriers to treat disorders, symptoms and diseases where HDAC6 plays a role.

EXPERIMENTAL PROCEDURES

Definitions

AcOH acetic acid
ACN acetonitrile
ATP adenosine triphosphate
BOC tert-butoxycarbonyl
m-CPBA m-chloroperbenzoic acid
DCE dichloroethane
DCM dichloromethane
DIPEA diisopropylethyl amine
DMEM Dulbecco's Modified Eagle's Medium
DMF N,N-dimethylformamide
DMFDMA N,N-dimethylformamide dimethyl acetal
DMAP N,N-dimethylaminopyridine
DMS dimethylsulfide
DMSO dimethylsulfoxide
DPPA diphenylphosphoryl azide
DTT dithiothreitol
EDCI N-(3-dimethylaminopropyl)-N'-ethylcarbodiimide hydrochloride
EDTA ethylenediaminetetraacetic acid
EtOAc ethyl acetate
EtOH ethanol
FA formic acid
FBS fetal bovine serum
h hours
HATU N,N,N',N'-tetramethyl-o-(7-azabenzotriazole-1-yl)uronium hexafluorophosphate
HBTU o-benzotriazol-1-yl-N,N,N',N'-tetramethyluronium hexafluorophosphate
HEPES N-(2-hydroxyethyl)piperazine-N'-(2-ethanesulfonic acid)
HOBT 1-hydroxybenzotriazole hydrate
HRMS high resolution mass spectrum LAH lithium aluminum hydride
LCMS liquid chromatography mass spectrum
m/z mass to charge
Me methyl
MeOH methanol
min minutes
MS mass spectrum
MTT methylthiazolotetrazolium
MWI microwave irradiation
NBS N-bromosuccinimide
NMM N-methyl morpholine
PBS phosphate buffered saline
PKA cAMP-dependent protein kinase

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PMB 4-methoxy benzylamine
rt room temperature
TEA triethylamine
TFAA trifluoroacetic anhydride
THF tetrahydrofuran
TMB 3,3',5,5'-tetramethylbenzidine
WST (4-[3-(4-iodophenyl)-2-(4-nitrophenyl)-2H-5-tetrazolo]-1,3-benzene disulfonate sodium salt)

Analytical Methods

NMR

¹H NMR Spectra were run on a 300 MHz or 400 MHz Bruker NMR unless otherwise stated.

LCMS

LCMS spectra were run on a Phenomenex Luna 5 µm C18 50×4.6 mm column on a Hewlett-Packard HP1100 using one of the following gradients unless otherwise stated:

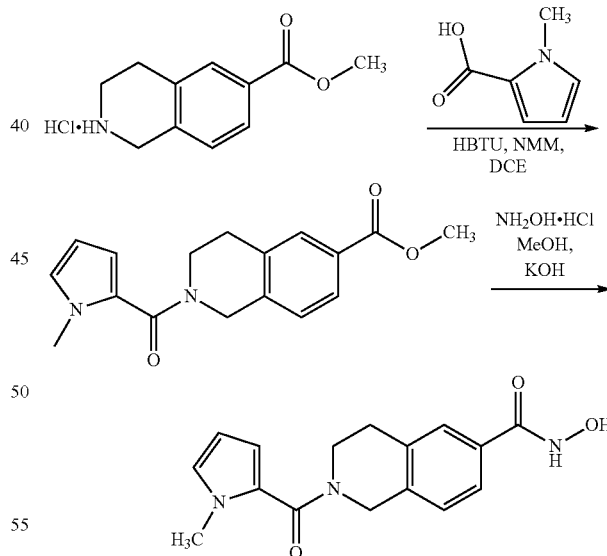
- (1) Method Formic Acid (FA): Acetonitrile containing 0 to 100 percent 0.1% formic acid in water (2.5 ml/min for a 3 minute run).
- (2) Method Ammonium Acetate (AA): Acetonitrile containing 0 to 100 percent 10 mM ammonium acetate in water (2.5 ml/min for a 3 minute run).

HPLC

Reverse phase preparative purification were performed on either a Gilson HPLC or Agilent A2Prep LCMS system employing a Waters Sunfire C18 10 mm 19×150 mm column unless otherwise stated.

Example 1

Synthesis of N-hydroxy-2-[(1-methyl-1H-pyrrol-2-yl)carbonyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 1)



Step 1: To a solution of N-methylpyrrole-2-carboxylic acid (30.9 mg, 0.247 mmol) and HBTU (122.72 mg, 0.32 mmol) in anhydrous DCE (1.5 mL, 23.4 mmol) was added N-methylmorpholine (0.036 mL, 0.329 mmol). The reaction mixture was allowed to stir for 5 minutes. Solid 6-methoxycarbonyl-1,2,3,4-tetrahydroisoquinoline hydrochloride (53.27 mg, 0.234 mmol) was then added and the reaction mixture was allowed to stir at room temperature overnight. The solvent was removed in vacuo and the residue partitioned between ethyl acetate (15 mL) and saturated aqueous sodium bicar-

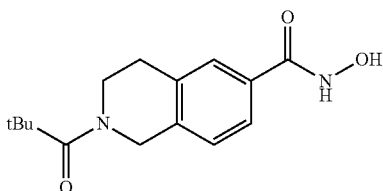
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bonate (15 mL). The organic layer was further washed with brine (15 mL), dried over anhydrous magnesium sulfate, filtered and concentrated. LCMS confirmed the intermediate methyl 2-[(1-methyl-1H-pyrrol-2-yl)carbonyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxylate formed [(FA) ES+ 299].

Step 2: Methyl 2-[(1-methyl-1H-pyrrol-2-yl)carbonyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxylate obtained in the previous step was dissolved in anhydrous methanol (1.6 mL, 39.53 mmol). Hydroxylamine hydrochloride (30.52 mg, 0.4392-mmol) and potassium hydroxide (49.28 mg, 0.878 mmol) were added respectively to the solution and the heterogeneous mixture was heated at 80° C. for 2 hours. The reaction mixture was concentrated and the residue re-dissolved in 1.3 mL of DMSO. The residual solids were removed via filtration and the solution purified via reverse phase prep HPLC to afford a white solid upon lyophilization of fractions containing the title compound (2.65 mg, 3.78%). LCMS (FA) ES+ 300; ¹H NMR (400 MHz, d₄-Methanol) δ: 7.64-7.57 (m, 2H), 7.24 (br d, J=7.8 Hz, 1H), 6.85 (dd, J=2.5, 1.5 Hz, 1H), 6.50 (dd, J=3.8, 1.6 Hz, 1H), 6.12 (dd, J=3.7, 2.7 Hz, 1H), 4.90 (s, 2H), 3.97 (t, J=6.1, 2H), 3.74 (t, 3H), 3.00 (t, J=6.1 Hz, 2H).

Example 2

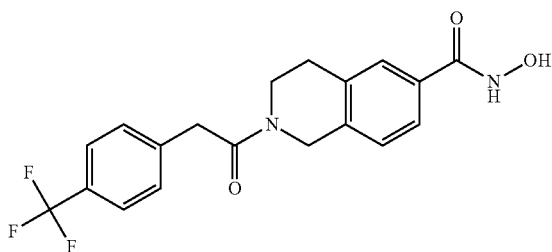
Synthesis of 2-(2,2-dimethylpropanoyl)-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 2)



The title compound was prepared in an analogous fashion to that described in Example 1 using the appropriate acid starting material. Yield: 3.6%; LCMS: (FA) ES+ 277; ¹H NMR (400 MHz, d₄-Methanol) δ: 7.576-7.536 (m, 2H), 7.27 (d, J=5.467 Hz, 1H), 4.81 (s, 2H), 3.91 (t, J=5.716 Hz, 2H), 2.94 (t, J=6.095 Hz, 2H), 1.32 (s, 9H).

Example 3

Synthesis of N-hydroxy-2-[4-(trifluoromethyl)phenyl]acetyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 3)



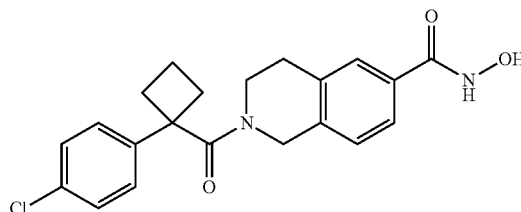
The title compound was prepared in an analogous fashion to that described in Example 1, using the appropriate acid starting material. Yield: 7.7%; LCMS: (FA) ES+ 378; ¹H

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NMR (400 MHz, d₆ DMSO) δ: 7.632-7.440 (m, 7H), 4.78 (d, 2H, J=7.058 Hz), 3.97 (s, 2H), 3.845-3.790 (m, 2H), 2.919-2.835 (m, 2H).

Example 4

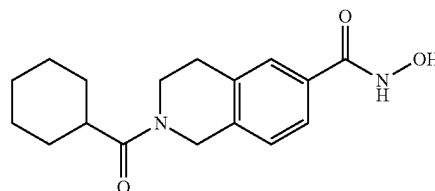
Synthesis of 2-[[1-(4-chlorophenyl)cyclobutyl]carbonyl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 4)



The title compound was prepared in an analogous fashion to that described in Example 1, using the appropriate acid starting material, except that DMF was used instead of DCE. Yield: 22.1%; LCMS: (FA) ES+ 386.

Example 5

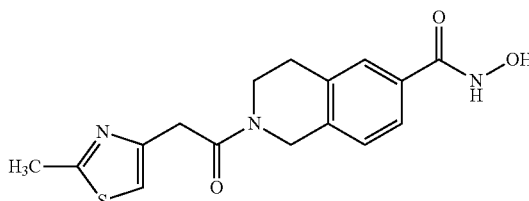
Synthesis of 2-(cyclohexylcarbonyl)-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 5)



The title compound was prepared in an analogous fashion as that described in Example 1, using the appropriate acid starting material, except that DMF was used instead of DCE. Yield: 8.6%; LCMS: (FA) ES+ 246.

Example 6

Synthesis of N-hydroxy-2-[(2-methyl-1,3-thiazol-4-yl)acetyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 6)



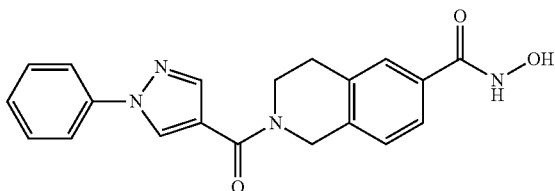
The title compound was prepared in an analogous fashion as that described in Example 1, using the appropriate acid

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starting material, except that DMF was used instead of DCE.
Yield: 23.2%; LCMS: (FA) ES+ 332.

Example 7

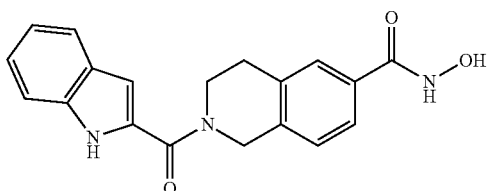
Synthesis of N-hydroxy-2-[(1-phenyl-1H-pyrazol-4-yl)carbonyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 7)



The title compound was prepared in an analogous fashion as that described in Example 1, using the appropriate acid starting material, except that DMF was used instead of DCE. Yield: 5.2%; LCMS: (FA) ES+ 363.

Example 8

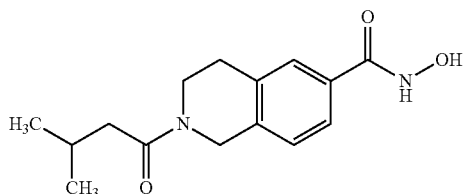
Synthesis of N-hydroxy-2-(1H-indol-2-ylcarbonyl)-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 8)



The title compound was prepared in a fashion analogous to that described in Example 1, using the appropriate acid starting material, except that 90% DMF/H₂O was used instead of DCE as solvent, iPr₂NEt was used instead of NMM, and HATU was used instead of HBTU. Yield: 4.2%; LCMS: (FA) ES+ 336.

Example 9

Synthesis of N-hydroxy-2-(3-methylbutanoyl)-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 9)

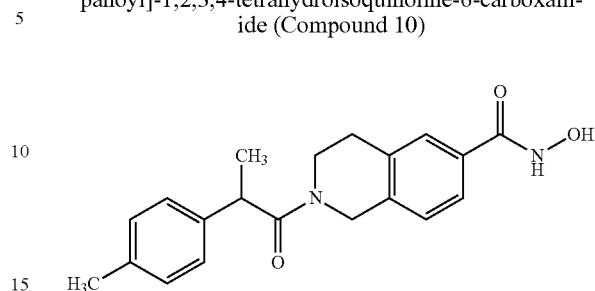


The title compound was prepared in a fashion analogous to that described in Example 1, using the appropriate acid starting material, except that 90% DMF/H₂O was used instead of DCE as solvent, iPr₂NEt was used instead of NMM, and HATU was used instead of HBTU. Yield: 3.9%; LCMS: (FA) ES+ 277.

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Example 10

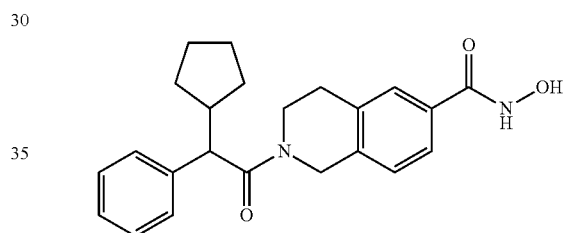
Synthesis of N-hydroxy-2-[2-(4-methylphenyl)propanoyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 10)



The title compound was prepared in a fashion analogous to that described in Example 1, using the appropriate acid starting material, except that 90% DMF/H₂O was used instead of DCE as solvent, iPr₂NEt was used instead of NMM, and HATU was used instead of HBTU. Yield 3.3%; LCMS: (FA) ES+ 339.

Example 11

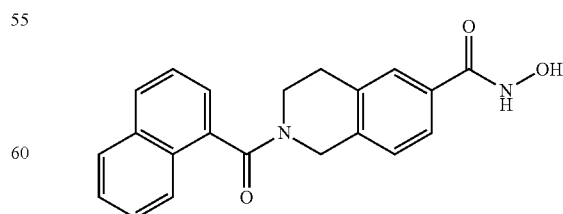
Synthesis of 2-[cyclopentyl(phenyl)acetyl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 11)



The title compound was prepared in a fashion analogous to that described in Example 1, using the appropriate acid starting material, except that 90% DMF/H₂O was used instead of DCE as solvent, iPr₂NEt was used instead of NMM, and HATU was used instead of HBTU. Yield: 0.2%; LCMS: (FA) ES+ 379.

Example 12

Synthesis of N-hydroxy-2-(1-naphthoyl)-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 12)



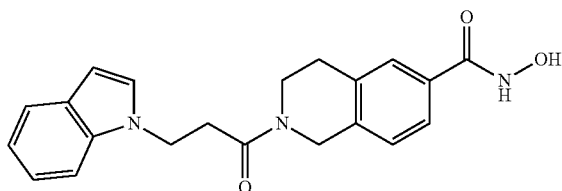
The title compound was prepared in a fashion analogous to that described in Example 1, using the appropriate acid starting material, except that 90% DMF/H₂O was used instead of

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DCE as a solvent, $i\text{Pr}_2\text{NEt}$ was used instead of NMM, HATU was used instead of HBTU. Yield: 1.5%; LCMS: (FA) ES+ 346.

Example 13

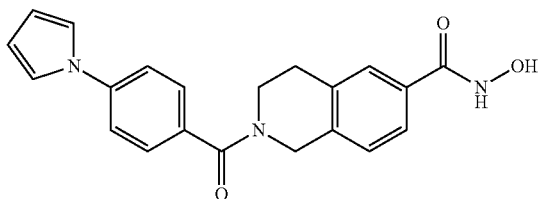
Synthesis of N-hydroxy-2-[3-(1H-indol-1-yl)propanoyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 13)



The title compound was prepared in a fashion analogous to that described in Example 1, using the appropriate acid starting material, except that 90% DMF/ H_2O was used instead of DCE as solvent, $i\text{Pr}_2\text{NEt}$ was used instead of NMM, and HATU was used instead of HBTU. Yield: 0.2%; LCMS: (FA) ES+ 364.6.

Example 14

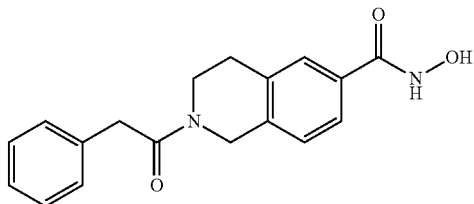
Synthesis of N-hydroxy-2-[4-(1H-pyrrol-1-yl)benzoyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 14)



The title compound was prepared in a fashion analogous to that described in Example 1, using the appropriate acid starting material, except that 90% DMF/ H_2O was used instead of DCE as solvent, $i\text{Pr}_2\text{NEt}$ was used instead of NMM, and HATU was used instead of HBTU. Yield: 2.6%; LCMS: (FA) ES+ 363.

Example 15

Synthesis of N-hydroxy-2-(phenylacetyl)-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 15)

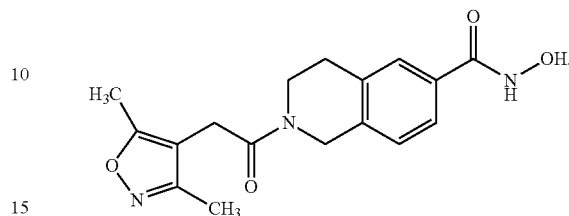


The title compound was prepared in a fashion analogous to that described in Example 1, using the appropriate acid starting material, except that 90% DMF/ H_2O was used instead of DCE as solvent, $i\text{Pr}_2\text{NEt}$ was used instead of NMM, and HATU was used instead of HBTU. Yield: 1.3%; LCMS: (FA) ES+ 311.

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Example 16

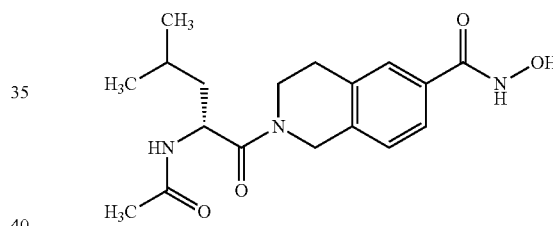
Synthesis of 2-[(3,5-dimethylisoxazol-4-yl)acetyl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 16)



The title compound was prepared in a fashion analogous to that described in Example 1, using the appropriate acid starting material, except that 90% DMF/ H_2O was used in place of DCE as a solvent, $i\text{Pr}_2\text{NEt}$ was used in place of NMM, and HATU was used in stead of HBTU. Yield: 5.3%; LCMS: (FA) ES+ 330.

Example 17

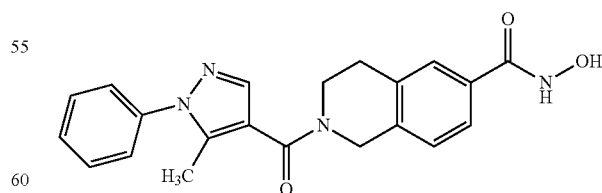
Synthesis of 2-[(2R)-2-(acetylamino)-4-methylpentanoyl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 17)



The title compound was prepared in a fashion analogous to that described in Example 1, using the appropriate acid starting material, except that 90% DMF/ H_2O was used instead of DCE as solvent, $i\text{Pr}_2\text{NEt}$ was used instead of NMM, and HATU was used instead of HBTU. Yield: 2.9%; LCMS: (FA) ES+ 348.

Example 18

Synthesis of N-hydroxy-2-[(5-methyl-1-phenyl-1H-pyrazol-4-yl)carbonyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 18)

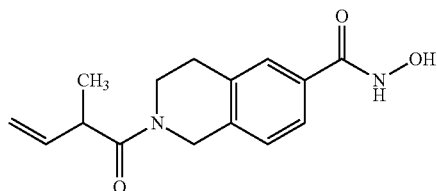


The title compound was prepared in a fashion analogous to that described in Example 1, using the appropriate acid starting material, except that 90% DMF/ H_2O was used instead of DCE as solvent, $i\text{Pr}_2\text{NEt}$ was used instead of NMM, and HATU was used instead of HBTU. Yield: 3.7%; LCMS: (FA) ES+ 377.

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Example 19

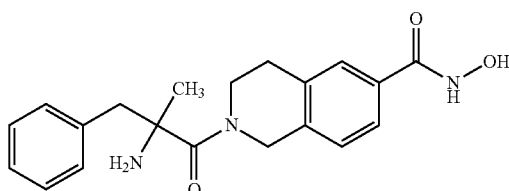
Synthesis of N-hydroxy-2-(2-methylbut-3-enoyl)-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 19)



The title compound was prepared in a fashion analogous to that described in Example 1, using the appropriate acid starting material, except that 90% DMF/H₂O was used instead of DCE as solvent, iPr₂NEt was used instead of NMM, and HATU was used instead of HBTU. Yield: 6.1%; LCMS: (FA) ES+ 275.

Example 20

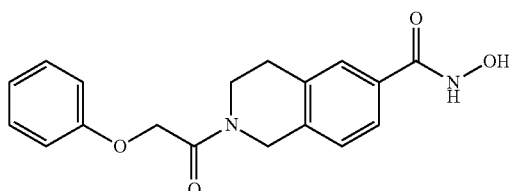
Synthesis of 2-(2-amino-2-methyl-3-phenylpropanoyl)-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 20)



The title compound was prepared in a fashion analogous to that described in Example 1, using the appropriate acid starting material, except that 90% DMF/H₂O was used instead of DCE as solvent, iPr₂NEt was used instead of NMM, and HATU was used instead of HBTU. Yield: 13.6%; LCMS: (FA) ES+ 354.

Example 21

Synthesis of N-hydroxy-2-(phenoxyacetyl)-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 21)

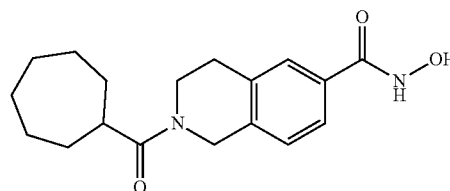


The title compound was prepared in a fashion analogous to that described in Example 1, using the appropriate acid starting material, except that 90% DMF/H₂O was used instead of DCE as solvent, iPr₂NEt was used instead of NMM, and HATU was used instead of HBTU. Yield: 5.9%; LCMS: (FA) ES+ 327.

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Example 22

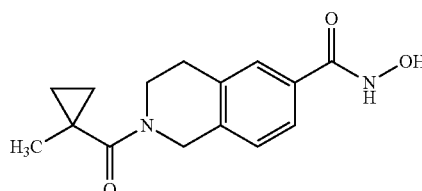
Synthesis of 2-(cycloheptylcarbonyl)-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 22)



The title compound was prepared in a fashion analogous to that described in Example 1, using the appropriate acid starting material, except that 90% DMF/H₂O was used instead of DCE as solvent, iPr₂NEt was used instead of NMM, and HATU was used instead of HBTU. Yield: 13.3%; LCMS: (FA) ES+ 317.

Example 23

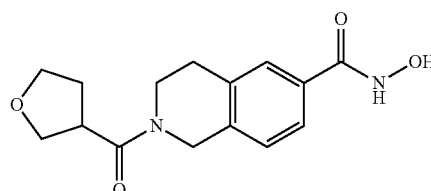
Synthesis of N-hydroxy-2-(1-methylcyclopropanecarbonyl)-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 23)



The title compound was prepared in a fashion analogous to that described in Example 1, using the appropriate acid starting material, except that 90% DMF/H₂O was used instead of DCE as solvent, iPr₂NEt was used instead of NMM, and HATU was used instead of HBTU. Yield: 8.7%; LCMS: (FA) ES+ 275.

Example 24

Synthesis of N-hydroxy-2-(tetrahydrofuran-3-ylcarbonyl)-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 24)

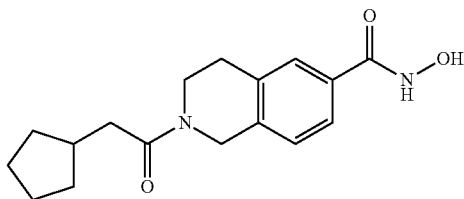


The title compound was prepared in a fashion analogous to that described in Example 1, using the appropriate acid starting material, except that 90% DMF/H₂O was used instead of DCE as solvent, iPr₂NEt was used instead of NMM, and HATU was used instead of HBTU. Yield: 10.3%; LCMS: (FA) ES+ 291.

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Example 25

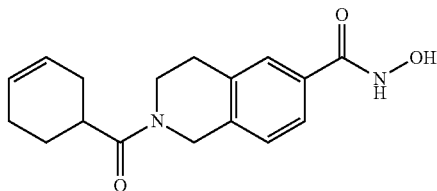
Synthesis of 2-(cyclopentylacetyl)-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 25)



The title compound was prepared in a fashion analogous to that described in Example 1, using the appropriate acid starting material, except that 90% DMF/H₂O was used instead of DCE as solvent, iPr₂NEt was used instead of NMM, and HATU was used instead of HBTU. Yield: 13%; LCMS: (FA) ES+ 303.

Example 26

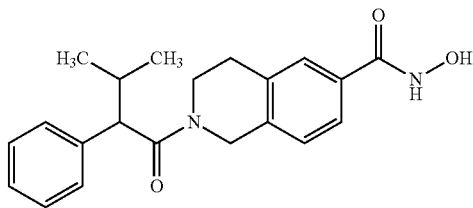
Synthesis of 2-(cyclohex-3-en-1-ylcarbonyl)-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 26)



The title compound was prepared in a fashion analogous to that described in Example 1, using the appropriate acid starting material, except that 90% DMF/H₂O was used instead of DCE as solvent, iPr₂NEt was used instead of NMM, and HATU was used instead of HBTU. Yield: 7.1%; LCMS: (FA) ES+ 301.

Example 27

Synthesis of N-hydroxy-2-(3-methyl-2-phenylbutanoyl)-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 27)

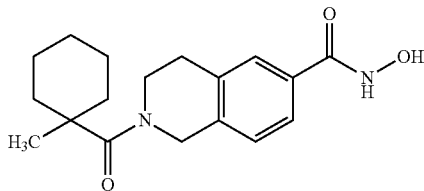


The title compound was prepared in a fashion analogous to that described in Example 1, using the appropriate acid starting material, except that 90% DMF/H₂O was used instead of DCE as a solvent, iPr₂NEt was used instead of NMM, and HATU was used instead of HBTU. Yield: 26.3%; LCMS: (FA) ES+ 353.

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Example 28

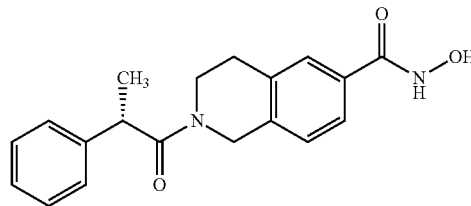
Synthesis of N-hydroxy-2-[(1-methylcyclohexyl)carbonyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 28)



The title compound was prepared in a fashion analogous to that described in Example 1, using the appropriate acid starting material, except that 90% DMF/H₂O was used instead of DCE as solvent, iPr₂NEt was used instead of NMM, and HATU was used instead of HBTU. Yield: 13.3%; LCMS: (FA) ES+ 317.

Example 29

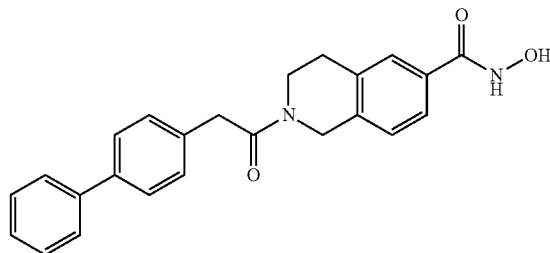
Synthesis of N-hydroxy-2-[(2S)-2-phenylpropanoyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 29)



The title compound was prepared in a fashion analogous to that described in Example 1, using the appropriate acid starting material, except that 90% DMF/H₂O was used instead of DCE as solvent, iPr₂NEt was used instead of NMM, and HATU was used instead of HBTU. Yield: 11.9%; LCMS: (FA) ES+ 325.

Example 30

Synthesis of 2-(biphenyl-4-ylacetyl)-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 30)

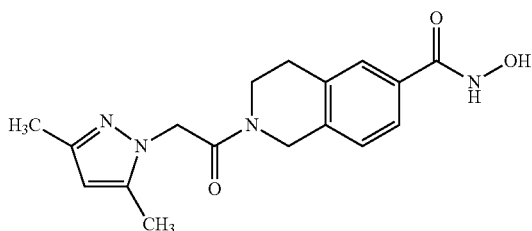


The title compound was prepared in a fashion analogous to that described in Example 1, using the appropriate acid starting material, except that 90% DMF/H₂O was used instead of DCE as solvent, iPr₂NEt was used instead of NMM, and HATU was used instead of HBTU. Yield: 2.9%; LCMS: (FA) ES+ 387.

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Example 31

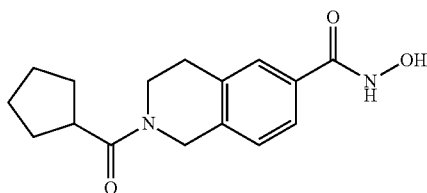
Synthesis of 2-[(3,5-dimethyl-1H-pyrazol-1-yl)acetyl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 31)



The title compound was prepared in a fashion analogous to that described in Example 1, using the appropriate acid starting material, except that 90% DMF/H₂O was used instead of DCE as solvent, iPr₂NEt was used instead of NMM, and HATU was used instead of HBTU. Yield: 11.4%; LCMS: (FA) ES+ 329.

Example 32

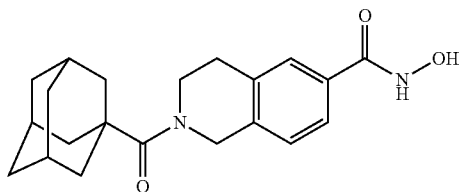
Synthesis of 2-(cyclopentylcarbonyl)-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 32)



The title compound was prepared in a fashion analogous to that described in Example 1, using the appropriate acid starting material, except that 90% DMF/H₂O was used instead of DCE as solvent, iPr₂NEt was used instead of NMM, and HATU was used instead of HBTU. Yield: 12.3%; LCMS: (FA) ES+ 289.

Example 33

Synthesis of 2-[1-adamantylcarbonyl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 33)

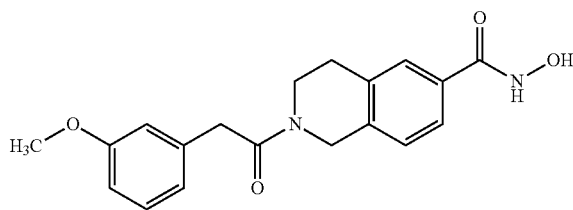


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The title compound was prepared in a fashion analogous to that described in Example 1, using the appropriate acid starting material, except that 90% DMF/H₂O was used instead of DCE as solvent, iPr₂NEt was used instead of NMM, and HATU was used instead of HBTU. Yield: 6.8%; LCMS: (FA) ES+ 355.

Example 34

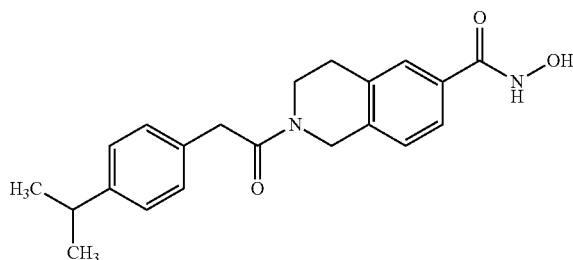
Synthesis of N-hydroxy-2-[(3-methoxyphenyl)acetyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 34)



The title compound was prepared in a fashion analogous to that described in Example 1, using the appropriate acid starting material, except that 90% DMF/H₂O was used instead of DCE as solvent, iPr₂NEt was used instead of NMM, and HATU was used instead of HBTU. Yield: 7.2%; LCMS: (FA) ES+ 341.

Example 35

Synthesis of N-hydroxy-2-[(4-isopropylphenyl)acetyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 35)

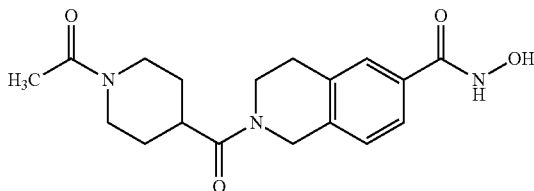


The title compound was prepared in a fashion analogous to that described in Example 1, using the appropriate acid starting material, except that 90% DMF/H₂O was used instead of DCE as solvent, iPr₂NEt was used instead of NMM, and HATU was used instead of HBTU. Yield: 12.5%; LCMS: (FA) ES+ 353.

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Example 36

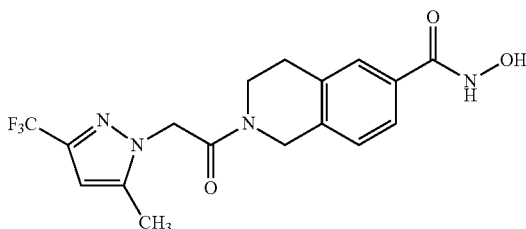
Synthesis of 2-[(1-acetylpiperidin-4-yl)carbonyl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 36)



The title compound was prepared in a fashion analogous to that described in Example 1, using the appropriate acid starting material, except that 90% DMF/H₂O was used instead of DCE as solvent, iPr₂NEt was used instead of NMM, and HATU was used instead of HBTU. Yield: 6%; LCMS: (FA) ES+ 346.

Example 37

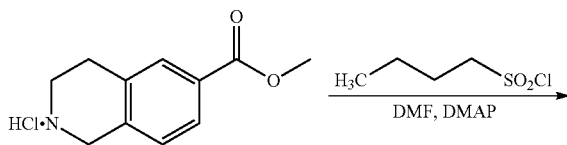
Synthesis of N-hydroxy-2-{[5-methyl-3-(trifluoromethyl)-1H-pyrazol-1-yl]acetyl}-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 37)



The title compound was prepared in a fashion analogous to that described in Example 1, using the appropriate acid starting material, except that 90% DMF/H₂O was used instead of DCE as solvent, iPr₂NEt was used instead of NMM, and HATU was used instead of HBTU. Yield: 3%; LCMS: (FA) ES+ 383.

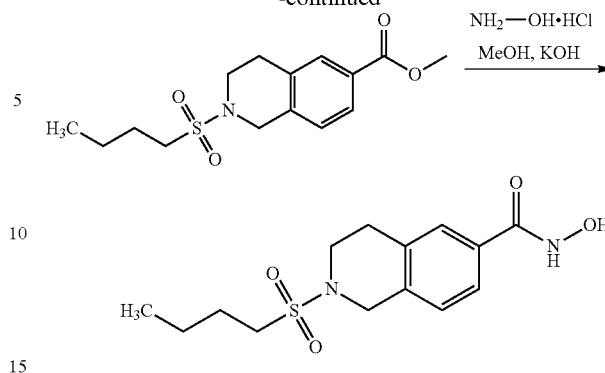
Example 38

Synthesis of 2-(butylsulfonyl)-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 38)



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-continued

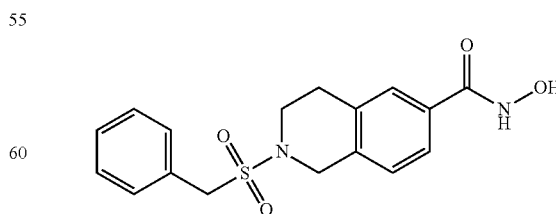


Step 1: To a mixture of 6-methoxycarbonyl-1,2,3,4-tetrahydroisoquinoline hydrochloride (50 mg, 0.22 mmol) and N,N-dimethylaminopyridine (110 mg, 0.9 mmol) in DMF (3.2 mL) was added n-butanesulfonyl chloride (34.4 mg, 0.22 mmol). The reaction was allowed to stir at room temperature overnight. The solvent was removed in vacuo and the residue obtained was partitioned between DCE (3×5 mL) and saturated aqueous sodium bicarbonate (5 mL). The organic layer was washed with brine, dried over magnesium sulfate, filtered and concentrated to yield a white solid. LCMS (FA) ES+ 405.

Step 2: To a solution of methyl 2-[(5-isoxazol-3-yl-2-thienyl)sulfonyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxylate obtained in step 1 in methanol (2 mL, 50 mmol) was added hydroxylamine hydrochloride (80 mg, 1 mmol) and potassium hydroxide (200 mg, 4 mmol). The reaction was left to stir for 2 hours at 80° C. Upon cooling to room temperature the solvent was removed in vacuo. The residue obtained was dissolved in DMSO (1 mL), the residual solids were removed by filtration and the resulting residue following evaporation was purified via reverse phase prep HPLC to afford the title compound as a white solid after lyophilization (Yield: 6.1%). LCMS (FA) ES+ 313; ¹H NMR (400 MHz, d₆ DMSO) δ: 0.87 (t, J=7.32, 7.46 Hz, 3H), 1.38 (q, J=7.545, 7.25, 7.57 Hz, 2H), 1.63 (q, J=7.76, 7.55, 7.80 Hz, 2H), 2.91 (t, J=5.29, 6.47 Hz, 2H), 4.44 (s, J=8.06, 7.81 Hz, 2H), 3.49 (t, 2H, 6.03 Hz, J=5.95), 4.44 (s, 2H), 7.24 (d, J=7.5 Hz, 1H), 7.56 (d, J=8.1 Hz, 1H), and 7.58 (s, 1H).

Example 39

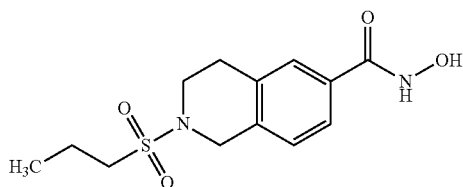
Synthesis of 2-(benzylsulfonyl)-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 39)



The title compound was prepared in a fashion analogous to that described in Example 38 using the appropriate sulfonyl chloride. Yield: 1.6%; LCMS: (FA) ES+ 347.

141**Example 40**

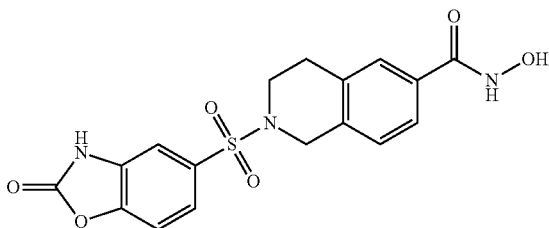
Synthesis of N-hydroxy-2-(propylsulfonyl)-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 40)



The title compound was prepared in a fashion analogous to that described in Example 38 using the appropriate sulfonyl chloride. Yield: 2.2%; LCMS: (FA) ES+ 299.

Example 41

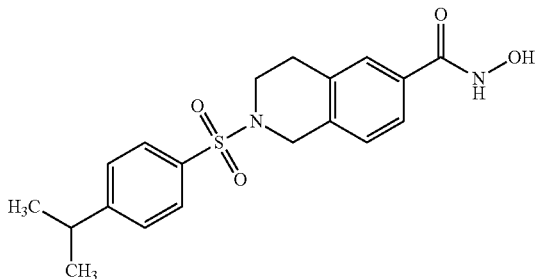
Synthesis of N-hydroxy-2-[(2-oxo-2,3-dihydro-1,3-benzoxazol-6-yl)sulfonyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 41)



The title compound was prepared in a fashion analogous to that described in Example 38 using the appropriate sulfonyl chloride. Yield: 0.5%; LCMS: (FA) ES+ 390.

Example 42

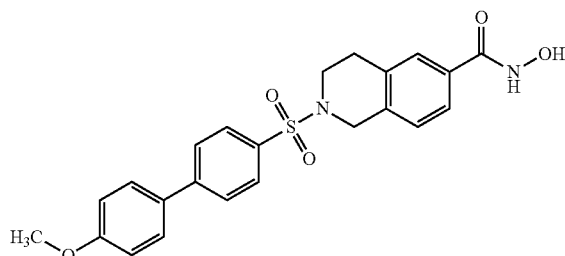
Synthesis of N-hydroxy-2-[(4-isopropylphenyl)sulfonyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 42)



The title compound was prepared in a fashion analogous to that described in Example 38 using the appropriate sulfonyl chloride. Yield: 6.4%; LCMS: (FA) ES+ 375.

142**Example 43**

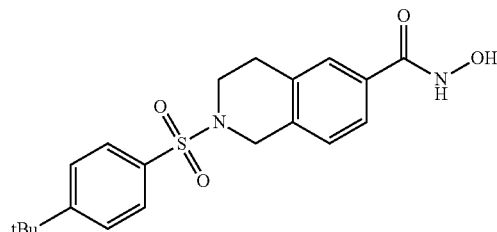
Synthesis of N-hydroxy-2-[(4'-methoxybiphenyl-4-yl)sulfonyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 43)



The title compound was prepared in a fashion analogous to that described in Example 38 using the appropriate sulfonyl chloride. Yield: 2.3%; LCMS: (FA) ES+ 440.

Example 44

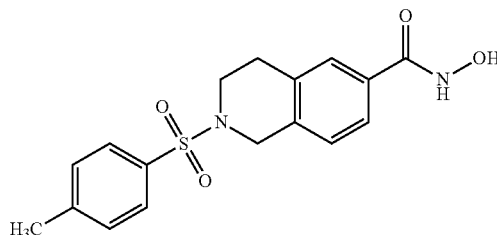
Synthesis of 2-[(4-tert-butylphenyl)sulfonyl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 44)



The title compound was prepared in a fashion analogous to that described in Example 38 using the appropriate sulfonyl chloride. Yield: 7.7%; LCMS: (FA) ES+ 389.

Example 45

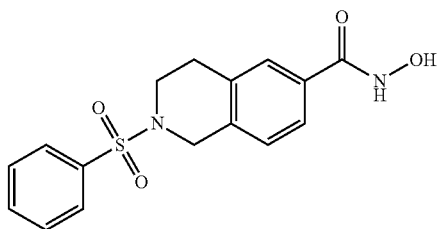
Synthesis of N-hydroxy-2-[(4-methylphenyl)sulfonyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 45)



The title compound was prepared in a fashion analogous to that described in Example 38 using the appropriate sulfonyl chloride. Yield: 5.8%; LCMS: (FA) ES+ 347.

143**Example 46**

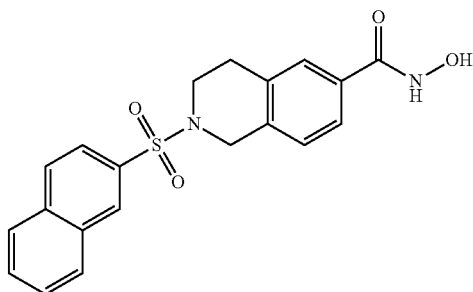
Synthesis of N-hydroxy-2-(phenylsulfonyl)-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 46)



The title compound was prepared in a fashion analogous to that described in Example 38 using the appropriate sulfonyl chloride. Yield: 0.6%; LCMS: (FA) ES+ 333.

Example 47

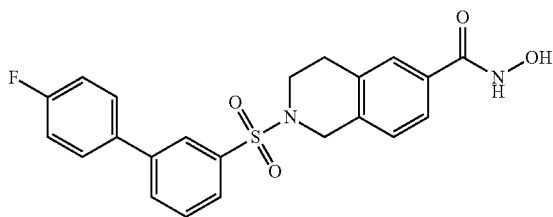
Synthesis of N-hydroxy-2-(2-naphthylsulfonyl)-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 47)



The title compound was prepared in a fashion analogous to that described in Example 38 using the appropriate sulfonyl chloride. Yield: 4.7%; LCMS: (FA) ES+ 383.

Example 48

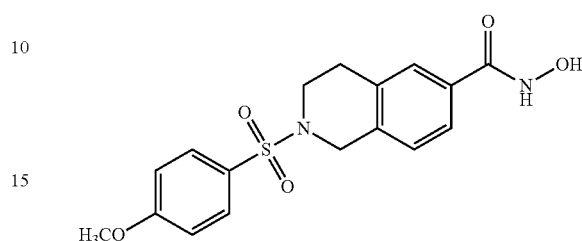
Synthesis of 2-[(4'-fluorobiphenyl-3-yl)sulfonyl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 48)



The title compound was prepared in a fashion analogous to that described in Example 38 using the appropriate sulfonyl chloride. Yield: 5.3%; LCMS: (FA) ES+ 427.

144**Example 49**

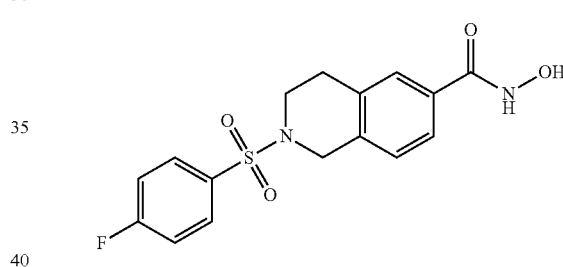
Synthesis of N-hydroxy-2-[(4-methoxyphenyl)sulfonyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 49)



The title compound was prepared in a fashion analogous to that described in Example 38 using the appropriate sulfonyl chloride. Yield: 2.0%; LCMS: (FA) ES+ 363.

Example 50

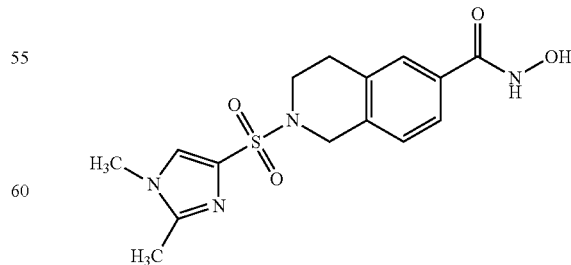
Synthesis of 2-[(4-fluorophenyl)sulfonyl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 50)



The title compound was prepared in a fashion analogous to that described in Example 38 using the appropriate sulfonyl chloride. Yield: 4.2%; LCMS: (FA) ES+ 351.

Example 51

Synthesis of 2-[(1,2-dimethyl-1H-imidazol-4-yl)sulfonyl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 51)

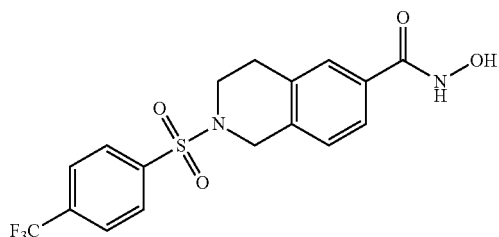


The title compound was prepared in a fashion analogous to that described in Example 38 using the appropriate sulfonyl chloride. Yield: 1.9%; LCMS: (FA) ES+ 351.

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Example 52

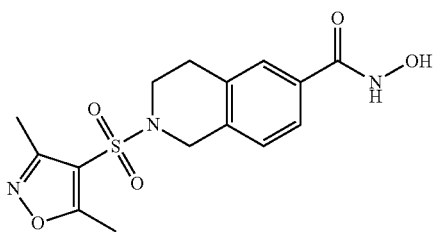
Synthesis of N-hydroxy-2-[[4-(trifluoromethyl)phenyl]sulfonyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 52)



The title compound was prepared in a fashion analogous to that described in Example 38 using the appropriate sulfonyl chloride. Yield: 3.3%; LCMS: (FA) ES+ 401.

Example 53

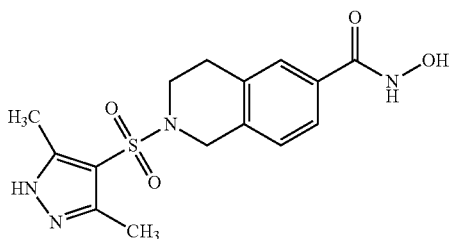
Synthesis of 2-[(3,5-dimethylisoxazol-4-yl)sulfonyl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 53)



The title compound was prepared in a fashion analogous to that described in Example 38 using the appropriate sulfonyl chloride. Yield: 7.8%; LCMS: (FA) ES+ 352.

Example 54

Synthesis of 2-[(3,5-dimethyl-4H-pyrazol-4-yl)sulfonyl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 54)

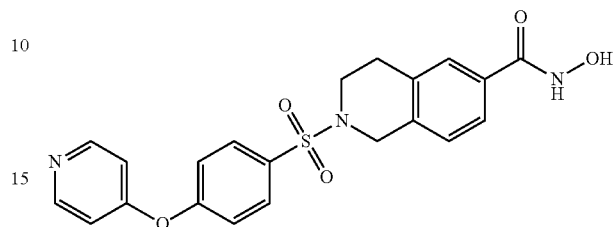


The title compound was prepared in a fashion analogous to that described in Example 38 using the appropriate sulfonyl chloride. Yield: 5.5%; LCMS: (FA) ES+ 351.

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Example 55

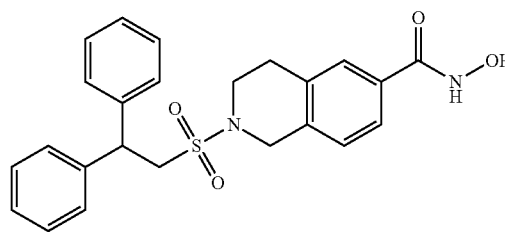
Synthesis of N-hydroxy-2-[[4-(pyridin-4-yloxy)phenyl]sulfonyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 55)



The title compound was prepared in a fashion analogous to that described in Example 38 using the appropriate sulfonyl chloride. Yield: 3.0%; LCMS: (FA) ES+ 426.

Example 56

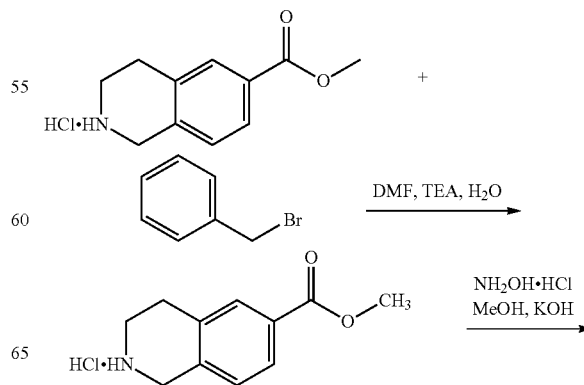
Synthesis of 2-[(2,2-diphenylethyl)sulfonyl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 56)



The title compound was prepared in a fashion analogous to that described in Example 38 using the appropriate sulfonyl chloride. Yield: 2.6%; LCMS: (FA) ES+ 438.

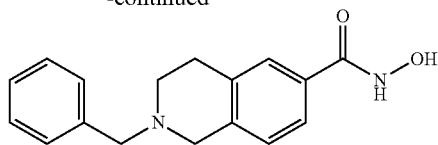
Example 57

Synthesis of 2-benzyl-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 57)



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-continued

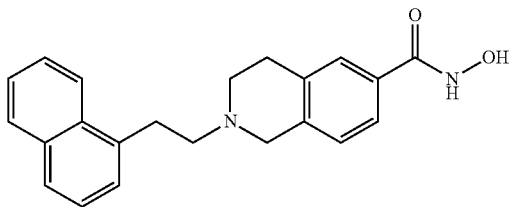


Step 1: To a solution of 6-methoxycarbonyl-1,2,3,4-tetrahydroisoquinoline hydrochloride (34.2 mg, 0.15 mmol) and triethylamine (83.6 μ L, 0.6 mmol) in N,N-dimethylformamide (1 mL, 13 mmol) and water (25 μ L, 1.39 mmol) was added benzyl bromide (16 μ L, 0.135 mmol). The reaction was allowed to stir overnight at room temperature. The solvent was removed in vacuo and the residue obtained was partitioned between DCE (3 \times 5 mL) and saturated aqueous sodium bicarbonate (5 mL). The organic layer was washed with brine, dried over magnesium sulfate, filtered and concentrated. LCMS confirmed formation of intermediate [(FA) ES+ 282].

Step 2: To a solution of the intermediate obtained in Step 1 dissolved in methanol (1.5 mL, 36 mmol) was added hydroxylamine hydrochloride (40 mg, 0.5 mmol) and potassium hydroxide (70 mg, 1 mmol). The vessel was sonicated until all the solid went into solution. The reaction was left to stir for 2 hours at 80° C. The reaction was allowed to cool to room temperature and concentrated. The material was dissolved in DMSO, residual solids were removed by filtration and purified via reverse phase prep HPLC to afford the title compound as a white solid (7.7 mg; yield: 19.8%). LC/MS: (FA) ES+ 347; ¹H NMR (400 MHz, d₆ DMSO) δ 7.515-7.066 (m, 8H), 3.65 (s, 2H), 3.56 (s, 2H), 2.84 (t, 2H, J=11.368 Hz), 2.68 (t, 2H, J=11.611 Hz).

Example 58

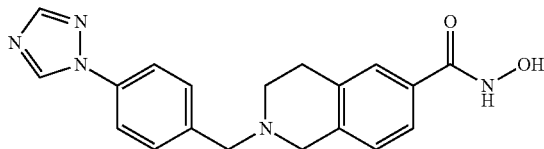
Synthesis of N-hydroxy-2-[2-(1-naphthyl)ethyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 58)



The title compound was prepared in a fashion analogous to that described in Example 57 using the appropriate alkyl halide. Yield: 3.6%; LCMS: (FA) ES+ 347.

Example 59

Synthesis of N-hydroxy-2-[4-(1H-1,2,4-triazol-1-yl)benzyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 59)



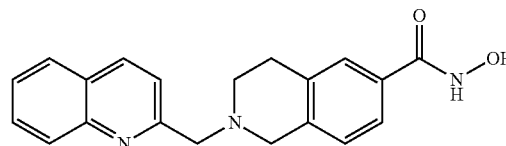
The title compound was prepared in a fashion analogous to that described in Example 57 using the appropriate alkyl halide. Yield: 19.8%; LCMS: (FA) ES+ 350; ¹H NMR (400

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MHz, d₆ DMSO) δ : 2.72 (t, 2H, J=11.27 Hz), 2.86 (t, 2H, J=12.025 Hz), 3.60 (s, 2H), 3.73 (s, 2H), 7.877-7.085 (m, 7H), 8.16 (s, 1H), and 8.24 (s, 1H).

Example 60

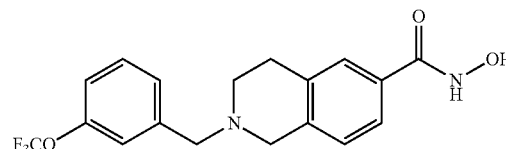
Synthesis of N-hydroxy-2-(quinolin-2-ylmethyl)-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 60)



The title compound was prepared in a fashion analogous to that described in Example 57 using the appropriate alkyl halide. Yield: 10.8%; LCMS: (FA) ES+ 334; ¹H NMR (400 MHz, d₆ DMSO) δ : 2.80 (d, 2H, J=5.191 Hz), 2.87 (d, 2H, J=5.372 Hz), 3.67 (s, 2H), 3.96 (s, 2H), and 8.350-7.075 (m, 9H).

Example 61

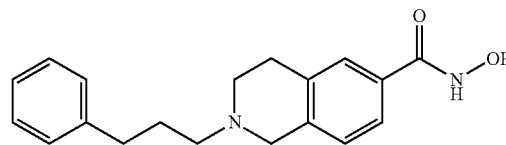
Synthesis of N-hydroxy-2-[4-(trifluoromethoxy)benzyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 61)



The title compound was prepared in a fashion analogous to that described in Example 57 using the appropriate alkyl halide. Yield: 4.3%; LCMS: (FA) ES+ 367.

Example 62

Synthesis of N-hydroxy-2-(3-phenylpropyl)-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 62)

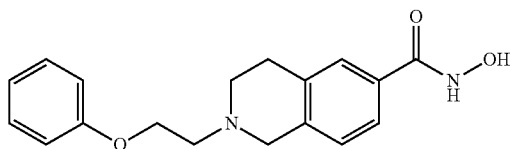


The title compound was prepared in a fashion analogous to that described in Example 57 using the appropriate alkyl halide. Yield: 1.3%; LCMS: (FA) ES+ 311.

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Example 63

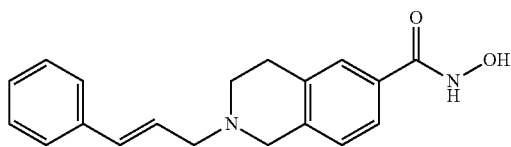
Synthesis of N-hydroxy-2-(2-phenoxyethyl)-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 63)



The title compound was prepared in a fashion analogous to that described in Example 57 using the appropriate alkyl halide. Yield: 2.6%; LCMS: (FA) ES+ 313.

Example 64

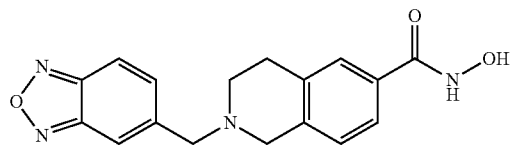
Synthesis of N-hydroxy-2-[(2E)-3-phenylprop-2-en-1-yl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 64)



The title compound was prepared in a fashion analogous to that described in Example 57 using the appropriate alkyl halide. Yield: 4.7%; LCMS: (FA) ES+ 309.

Example 65

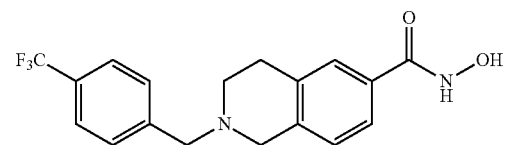
Synthesis of 2-(2,1,3-benzoxadiazol-5-ylmethyl)-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 65)



The title compound was prepared in a fashion analogous to that described in Example 57 using the appropriate alkyl halide. Yield: 3.4%; LCMS: (FA) ES+ 325.

Example 66

Synthesis of N-hydroxy-2-[4-(trifluoromethyl)benzyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 66)

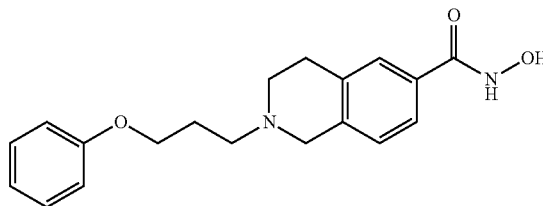


The title compound was prepared in a fashion analogous to that described in Example 57 using the appropriate alkyl halide. Yield: 10.1%; LCMS: (FA) ES+ 351.

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Example 67

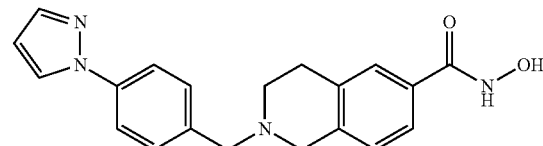
Synthesis of N-hydroxy-2-(3-phenoxypropyl)-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 67)



The title compound was prepared in a fashion analogous to that described in Example 57 using the appropriate alkyl halide. Yield: 2.2%; LCMS: (FA) ES+ 327.

Example 68

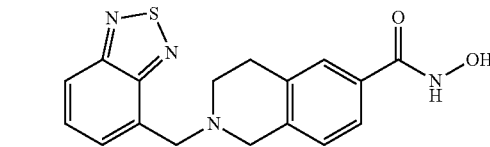
Synthesis of N-hydroxy-2-[4-(1H-pyrazol-1-yl)benzyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 68)



The title compound was prepared in a fashion analogous to that described in Example 57 using the appropriate alkyl halide. Yield: 4.2%; LCMS: (FA) ES+ 349.

Example 69

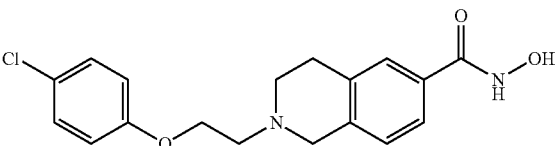
Synthesis of 2-(2,1,3-benzothiadiazol-4-ylmethyl)-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 69)



The title compound was prepared in a fashion analogous to that described in Example 57 using the appropriate alkyl halide. Yield: 8.5%; LCMS: (FA) ES+ 341.

Example 70

Synthesis of 2-[2-(4-chlorophenoxy)ethyl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound III)

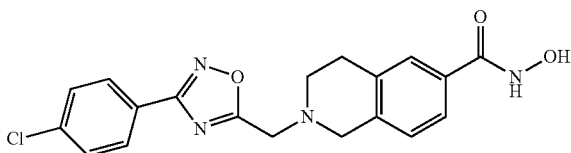


The title compound, was prepared in a fashion analogous to that described in Example 57 using the appropriate alkyl halide. Yield: 11.8%; LCMS: (FA) ES+ 348.

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Example 71

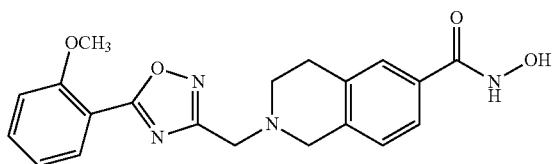
Synthesis of 2-[[3-(4-chlorophenyl)-1,2,4-oxadiazol-5-yl]methyl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 71)



The title compound was prepared in a fashion analogous to that described in Example 57 using the appropriate alkyl halide. Yield: 1.2%; LCMS: (FA) ES+ 385.

Example 72

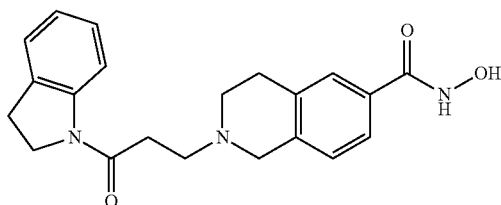
Synthesis of N-hydroxy-2-[[5-(2-methoxyphenyl)-1,2,4-oxadiazol-3-yl]methyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 72)



The title compound was prepared in a fashion analogous to that described in Example 57 using the appropriate alkyl halide. Yield: 1.8%; LCMS: (FA) ES+ 381.

Example 73

Synthesis of 2-[3-(2,3-dihydro-1H-indol-1-yl)-3-oxopropyl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 73)

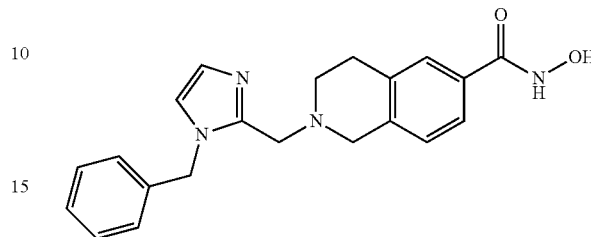


The title compound was prepared in a fashion analogous to that described in Example 57 using the appropriate alkyl halide. Yield: 2.4%; LCMS: (FA) ES+ 381.

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Example 74

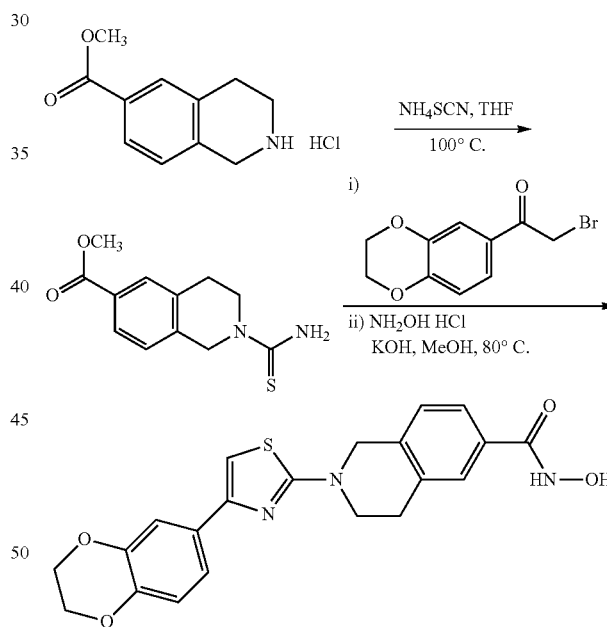
Synthesis of 2-[(1-benzyl-1H-imidazol-2-yl)methyl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 74)



The title compound was prepared in a fashion analogous to that described in Example 57 using the appropriate alkyl halide. Yield: 1.1%; LCMS: (FA) ES+ 363.

Example 75

Synthesis of 2-[4-(2,3-dihydro-1,4-benzodioxin-6-yl)-1,3-thiazol-2-yl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 75)



Step 1: A mixture of ammonium thiocyanate (0.105 g, 1.384 mmol), 6-methoxycarbonyl-1,2,3,4-tetrahydroisoquinoline hydrochloride (0.3 g, 1.3176 mmol) and THF (2 mL) was heated in a CEM microwave reactor for 1 h at 100°C . Upon cooling to room temperature, the reaction mixture was diluted with EtOAc, and washed with H_2O , 1 N HCl, saturated aqueous NaHCO_3 and brine respectively, dried over anhydrous MgSO_4 , and concentrated under reduced pressure to afford methyl 2-(aminocarbonothioyl)-1,2,3,4-tetrahydroisoquinoline-6-carboxylate (0.33 g, 47%) as a white solid. LCMS: (FA) ES+ 251.

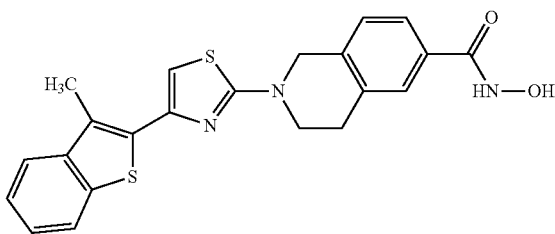
Step 2: A solution of 1,4-benzodioxan-6-ylbromomethyl ketone (0.051 g, 0.2 mmol), methyl 2-(aminocarbonothioyl)-1,2,3,4-tetrahydroisoquinoline-6-carboxylate (0.33 g, 0.2 mmol), and THF (2 mL) was heated in a CEM microwave reactor for 1 h at 100°C . Upon cooling to room temperature, the reaction mixture was diluted with EtOAc, and washed with H_2O , 1 N HCl, saturated aqueous NaHCO_3 and brine respectively, dried over anhydrous MgSO_4 , and concentrated under reduced pressure to afford Compound 75 (0.33 g, 47%) as a white solid. LCMS: (FA) ES+ 363.

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thieryl)-1,2,3,4-tetrahydroisoquinoline-6-carboxylate (0.05 g, 0.2 mmol) in 1,4-dioxane (1 mL) heated at 40° C. for 2 h. Upon cooling to room temperature, the solvent was removed under reduced pressure to afford a solid residue. To the solid residue was added hydroxylamine hydrochloride (0.056 g, 0.8 mmol), potassium hydroxide (0.09 g, 1.6 mmol), and methanol (2 mL). The mixture was heated at 80° C. for 2 h. Upon cooling to room temperature, the solvent was then removed under reduced pressure, the residue dissolved in DMSO (1 mL) and purified on Gilson prep-HPLC [236 nm, rt=7.54 min (12 min), 30-70% gradient MeCN—H₂O] to give 28.6 mg (35%) of the title compound as a white solid. LCMS: (FA) ES+ 410; ¹H NMR (MeOD, 400 MHz) δ 8.51 (s, 1H), 7.60 (m, 2H), 7.33 (m, 3H), 6.82 (s, 2H), 4.74 (m, 2H), 4.25 (m, 4H), 3.84 (m, 2H), 3.08 (m, 2H).

Example 76

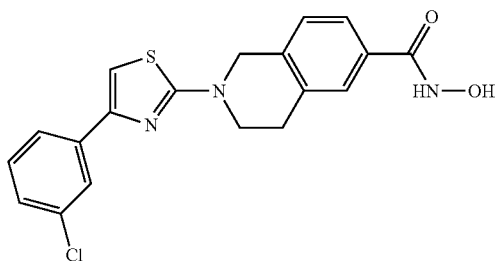
Synthesis of N-hydroxy-2-[4-(3-methyl-1-benzothien-2-yl)-1,3-thiazol-2-yl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 76)



The title compound was prepared in a fashion analogous to that described in Example 75. Yield: 20.4%; Purified using Gilson prep-HPLC [240 nm, rt=9.83 min (12 min), 50-90% gradient MeCN—H₂O]; LCMS: (FA) ES+ 422; ¹H NMR (CD₃CN, 400 MHz) δ 7.89 (m, 1H), 7.82 (m, 1H), 7.64 (m, 1H), 7.61 (m, 1H), 7.45-7.37 (m, 3H), 6.96 (s, 1H), 4.79 (s, 2H), 3.86 (t, J=6.0 Hz, 2H), 3.10 (t, J=6.0 Hz, 2H), 2.66 (s, 3H).

Example 77

Synthesis of 2-[4-(3-chlorophenyl)-1,3-thiazol-2-yl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 77)



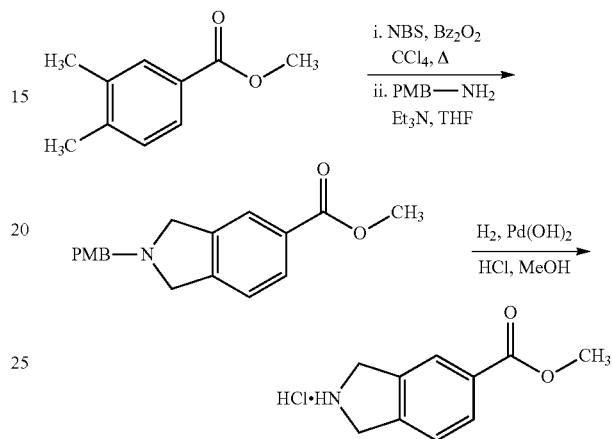
The title compound was prepared in a fashion analogous to that described in Example 75. Yield: 44.0%; Purified with Gilson prep-HPLC [240 nm, rt=8.64 (12 min), 40-80% gradient MeCN—H₂O]; ¹H NMR (d₆-DMSO, 400 MHz) δ 9.4 (br, 1H), 7.93 (m, 1H), 7.85 (d, J=7.8 Hz, 1H), 7.62 (m, 1H),

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7.59 (d, J=7.8 Hz, 1H), 7.44-7.33 (m, 4H), 4.72 (s, 2H), 3.78 (t, J=5.8 Hz, 2H), 3.00 (t, J=5.8 Hz, 2H).

Example 78

Synthesis of methyl 2,3-dihydro-1H-isoindole-5-carboxylate hydrochloride



Step 1: Synthesis of methyl 2-(4-methoxybenzyl)isoindoline-5-carboxylate

A mixture of methyl 3,4-dimethylbenzoate (1.334 g, 8.13 mmol), N-bromosuccinimide (3.173 g, 17.83 mmol) and benzoyl peroxide (0.143 g, 0.592 mmol) in carbon tetrachloride (5 mL) was heated at reflux for 1.5 hours. Upon cooling to room temperature, the solids present were removed by vacuum filtration and the resulting solution concentrated in vacuo. The residue obtained was re-dissolved in THF (30 mL). To the solution was added triethylamine (2.265 mL, 16.25 mmol) and a solution of 4-methoxy benzylamine (1.05 mL, 8.13 mmol) in THF (20 mL). The resulting reaction mixture was stirred overnight at room temperature. The precipitate was removed via filtration and the solution obtained was concentrated in vacuo. The residue obtained was purified via flash chromatography (15-30% EtOAc/hexane) to afford a light yellow oil (1.185 g). LCMS: (FA) ES+ 298; ¹H NMR (CDCl₃, 400 MHz) δ 7.89 (dd, J=7.8, 1.5 Hz, 1H), 7.84 (s, 1H), 8.74 (d, J=8.7 Hz, 2H), 7.313 (d, J=8.7 Hz 2H), 7.22 (d, J=7.2 Hz, 2H), 6.89 (d, J=8.7 Hz, 2H), 3.93 (s, 4H), 3.89 (s, 3H), 3.85 (s, 2H), 3.82 (s, 3H).

Step 2: Synthesis of methyl 2,3-dihydro-1H-isoindole-5-carboxylate hydrochloride

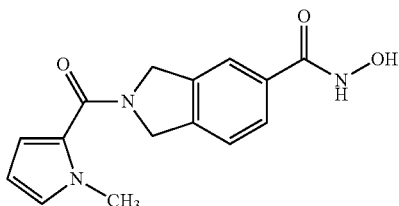
To a mixture of methyl 2-(4-methoxybenzyl)isoindoline-5-carboxylate (0.82 g, 2.76 mmol) and 20% palladium hydroxide on carbon (0.194 g, 0.276 mmol) in methanol (25 mL) was added concentrated HCl (0.41 mL, 0.11 mmol). The mixture was degassed and stirred under a balloon atmosphere of H₂ for two days. Additional 20% palladium hydroxide on carbon (0.08 g, 0.11 mmol) was then added and the reaction was continued for an additional day. The insolubles were removed via filtration through Clite and the solution was concentrated. Further drying under vacuum afforded a white

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powder (0.527 g, 91%). LCMS: (FA) ES+ 179. ¹H NMR (d₆-DMSO, 400 MHz) δ 9.71 (br s, 2H), 8.01 (s, 1H), 7.96 (d, J=8.0 Hz, 1H), 7.55 (d, J=7.7 Hz 2H), 4.56 (d, J=6.0 Hz, 4H), 3.87 (s, 3H).

Example 79

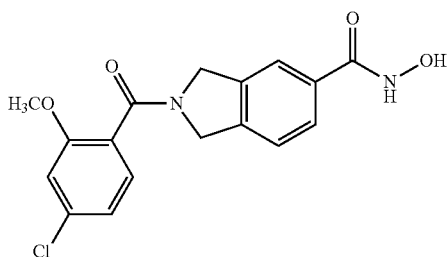
Synthesis of N-hydroxy-2-[(1-methyl-1H-pyrrol-2-yl)carbonyl]isoindoline-5-carboxamide (Compound 78)



To a mixture of N-methylpyrrole-2-carboxylic acid (25.7 mg, 0.21 mmol) and methyl 2,3-dihydro-1H-isoindole-5-carboxylate hydrochloride (40 mg, 0.19 mmol) in DCM was added HATU (78.2 mg, 0.21 mmol) and N-methylmorpholine (0.1 mL, 0.91 mmol). The heterogenous mixture was stirred overnight at room temperature during which time the mixture became a homogenous solution. The reaction solution was washed with saturated aqueous NaHCO₃ (2 mL) and the layers separated. The aqueous layer was washed with additional methylene chloride (3 mL) and the combined organic layers were concentrated. The residue obtained was dissolved in methanol (3 mL), and to the solution was added hydroxylamine hydrochloride (39 mg, 0.56 mmol) and potassium hydroxide (0.1 g, 1.8 mmol). The resulting mixture was heated to 80° C. for 30 minutes. Upon cooling to room temperature, the solvent was removed in vacuo. The residue was dissolved in DMSO (1 mL), the insolubles removed via filtration and purified by reverse phase prep-HPLC to afford the title compound as a white solid (27.1 mg, 50%). LCMS: (FA) ES+ 286; ¹H NMR (d₆-DMSO, 400 MHz) δ 7.80-7.71 (m, 1H), 7.84 (s, 1H), 7.62 (d, J=7.7 Hz, 1H), 7.43 (br d, J=10.2 Hz, 1H), 6.95 (t, J=2.1 Hz, 1H), 6.76 (dd, J=3.8, 1.6 Hz, 1H), 6.10 (dd, J=3.8, 2.5 Hz, 1H), 5.05 (br s, 2H), 4.87 (br s, 2H), 3.77 (s, 3H).

Example 80

Synthesis of 2-(4-chloro-2-methoxybenzoyl)-N-hydroxyisoindoline-5-carboxamide (Compound 79)

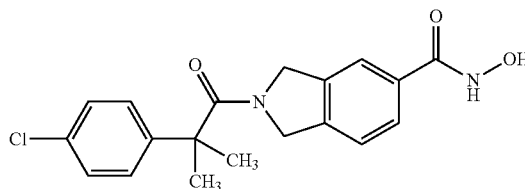


The title compound was prepared in a fashion analogous to that described in Example 79. Yield: 29%; LCMS: (FA) ES+ 345.

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Example 81

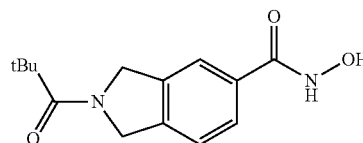
Synthesis of 2-[2-(4-chlorophenyl)-2-methylpropanoyl]-N-hydroxyisoindoline-5-carboxamide (Compound 80)



The title compound was prepared in a fashion analogous to that described in Example 79. Yield: 41%; LCMS: (FA) ES+ 359.

Example 82

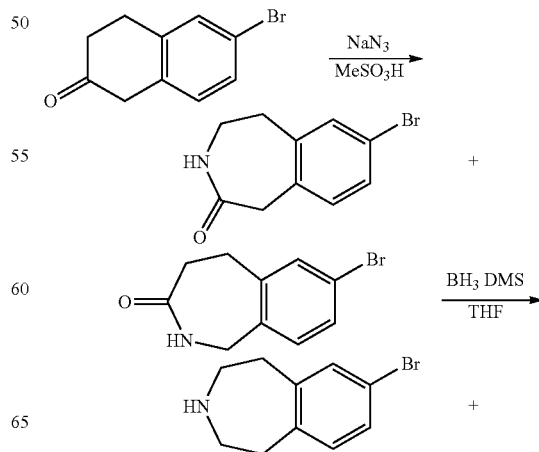
Synthesis of 2-(2,2-dimethylpropanoyl)-N-hydroxyisoindoline-5-carboxamide (Compound 81)



The title compound was prepared in an analogous fashion to that described in Example 79 to afford a white solid (13.3 mg, 27%). LCMS: (FA) ES+ 263.

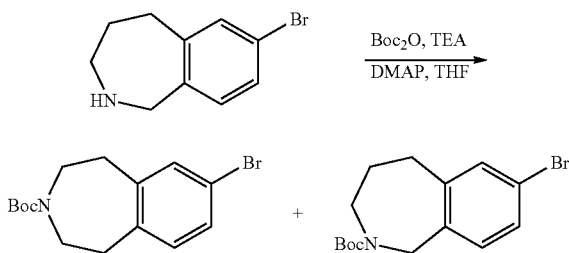
Example 83

Synthesis of tert-butyl 7-bromo-1,2,4,5-tetrahydro-3H-3-benzazepine-3-carboxylate and tert-butyl 7-bromo-1,3,4,5-tetrahydro-2H-2-benzazepine-2-carboxylate



157

-continued



To a 500-mL round-bottom flask was added 6-bromo-2-tetralone (10 g, 44.43 mmol) and methanesulfonic acid (47 mL, 72 mmol) at 0° C. Sodium azide (3.61 g, 55.5 mmol) was slowly added to the solution, and the reaction was stirred at room temperature for 2 h. The reaction mixture was slowly poured into a 2000-mL beaker containing potassium hydroxide (49.8 g, 888 mmol) in water (800 mL) with vigorous stirring. After the acid was completely quenched, the aqueous solution was extracted with EtOAc (3×500 mL). The combined organic layers were washed with saturated aqueous NaHCO₃ (100 mL) and brine (100 mL) respectively, dried over anhydrous MgSO₄ and concentrated to give a mixture of 7-bromo-1,3,4,5-tetrahydro-2H-3-benzazepin-2-one and 7-bromo-1,2,4,5-tetrahydro-3H-2-benzazepin-3-one as a brown solid which was used without purification. LCMS: (FA) ES+ 240 and 242.

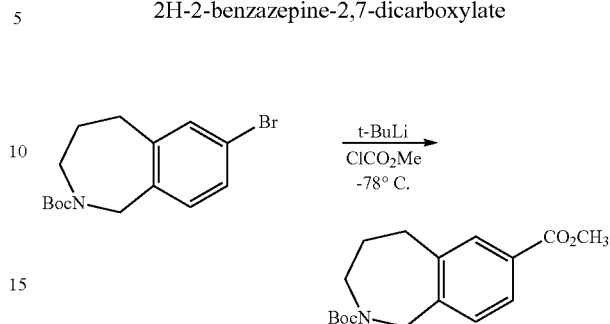
To a 1000-mL round-bottom flask was added the mixture of 7-bromo-1,3,4,5-tetrahydro-2H-3-benzazepin-2-one and 7-bromo-1,2,4,5-tetrahydro-3H-2-benzazepin-3-one (12.6 g, 52.4 mmol) and tetrahydrofuran (260 mL). The solution was cooled to 0° C. and borane-methylsulfide complex (12.4 mL, 210 mmol) was slowly added. The reaction mixture was stirred at 0° C. for 10 min, warmed to room temperature and stirred for 3 h, then heated at reflux for 4 h. Upon cooling to room temperature, the mixture was quenched with MeOH (50 mL) to remove excess borane. The solvent was then evaporated to give 7-bromo-2,3,4,5-tetrahydro-1H-benzazepine and 7-bromo-2,3,4,5-tetrahydro-1H-benzazepine as sticky oil. LCMS: (FA) ES+ 226 and 228.

To the residue in the 1000-mL round-bottom flask was added THF (260 mL), N,N-dimethylaminopyridine (0.641 g, 5.25 mmol), triethylamine (21.9 mL, 157 mmol), and di-tert-butyl dicarbonate (17.2 g, 78.7 mmol). The mixture was stirred at room temperature for 24 h. The solvent was then evaporated and the residue obtained was partitioned between EtOAc (1000 mL) and water (100 mL). The aqueous phase was further extracted with EtOAc (3×200 mL), the combined organic phases were washed with brine (100 mL), dried over anhydrous MgSO₄, and concentrated to give a solid residue. Purification via flash chromatography (EtOAc:hexanes, 0-10%) afforded tert-butyl 7-bromo-1,2,4,5-tetrahydro-3H-3-benzazepine-3-carboxylate (3.38 g, 20%); ¹H NMR (CDCl₃, 400 MHz) δ 7.24 (m, 2H), 6.99 (t, J=8.4 Hz, 1H), 3.54 (m, 2H), 2.85 (m, 4H), 1.48 (s, 9H); and tert-butyl 7-bromo-1,3,4,5-tetrahydro-2H-2-benzazepine-2-carboxylate (3.50 g, 21%); ¹H NMR (CDCl₃, 400 MHz) δ 7.30-7.24 (m, 2H), 7.04 (m, 1H), 4.34 (br, 0.7H), 4.31 (br, 1.3H), 3.66 (br, 2H), 2.90 (br, 2H), 1.76 (m, 2H), 1.38 (s, 9H).

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Example 84

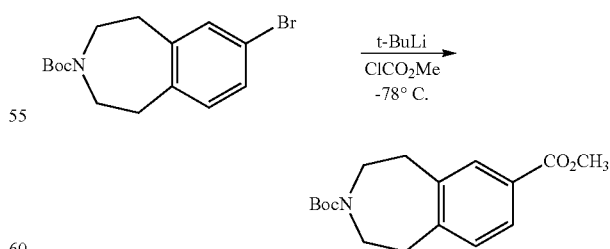
Synthesis of 2-tert-butyl 7-methyl 1,3,4,5-tetrahydro-2H-2-benzazepine-2,7-dicarboxylate



To a 50-mL round-bottom flask charged with THF (15 mL) cooled to -78° C. under an N₂ atmosphere was slowly added tert-butyllithium (0.922 mL, 1.474 mmol, 1.6 M in pentane). At this temperature, tert-butyl 7-bromo-1,3,4,5-tetrahydro-2H-2-benzazepine-2-carboxylate (0.37 g, 1.134 mmol) in THF (4 mL) was added. The resulting solution was stirred at -78° C. for 10 min. To the reaction flask was quickly added methyl chloroformate (1.75 mL, 22.68 mmol), and the resulting mixture was stirred at -78° C. for 30 min then warmed to room temperature for 10 min. The solvent was evaporated under reduced pressure and the residue was partitioned between water (10 mL) and EtOAc (50 mL). After separation, the aqueous phase was extracted with EtOAc (2×15 mL), the combined organic phases were washed with brine (10 mL), dried over anhydrous MgSO₄, and concentrated. Flash column chromatography (EtOAc:hexanes, 0-10%) provided 2-tert-butyl 7-methyl 1,3,4,5-tetrahydro-2H-2-benzazepine-2,7-dicarboxylate (0.142 g, 41%) as a slightly yellow solid. ¹H NMR (CDCl₃, 400 MHz) δ 7.83-7.80 (m, 2H), 7.24 (d, J=7.6 Hz, 1H), 4.45 (br, 0.7H), 4.40 (br, 1.3H), 3.90 (s, 3H), 3.68 (br, 2H), 3.00 (br, 2H), 1.78 (m, 2H), 1.37 (s, 9H).

Example 85

Synthesis of 2-tert-butyl 7-methyl 1,3,4,5-tetrahydro-2H-2-benzazepine-2,7-dicarboxylate

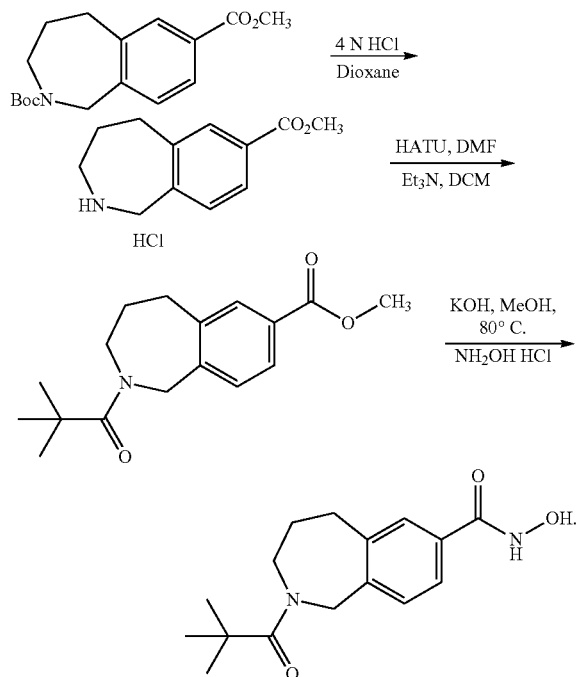


The title compound was prepared using a similar procedure to that described in Example 84. ¹H NMR (CDCl₃, 400 MHz) δ 7.82-7.79 (m, 2H), 7.24 (d, J=7.6 Hz, 1H), 3.90 (s, 3H), 3.55 (br, 4H), 2.95 (br, 4H), 1.48 (s, 9H).

159

Example 86

Synthesis of 2-(2,2-dimethylpropanoyl)-N-hydroxy-2,3,4,5-tetrahydro-1H-2-benzazepine-7-carboxamide (Compound 82)



To a vial charged with 2-tert-butyl 7-methyl 1,3,4,5-tetrahydro-2H-2-benzazepine-2,7-dicarboxylate (0.443 g, 0.145 mmol) and DCM cooled to 0° C. (1.5 mL) was slowly added 4.0 M HCl in 1,4-dioxane (1.5 mL). The reaction was then warmed to room temperature and stirred for 1 h. The solvent was removed to give methyl 2,3,4,5-tetrahydro-1H-benzazepine-7-carboxylate hydrochloride (0.035 g, 99%) as a white solid, which was used for the next step without further purification. LCMS: (FA) ES+ 206.

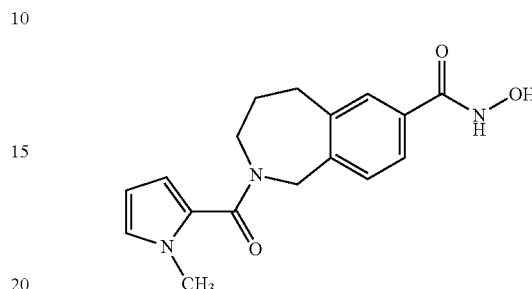
To a vial charged with trimethylacetic acid (0.016 g, 0.152 mmol), HATU (0.058 g, 0.152 mmol), DCM (2 mL) and N,N-dimethylformamide (0.2 mL) was added triethylamine (0.06 mL, 0.434 mmol). The solution was shaken at room temperature for 15 min whereupon a premixed solution of methyl 2,3,4,5-tetrahydro-1H-2-benzazepine-7-carboxylate hydrochloride (0.035 g, 0.145 mmol) and triethylamine (0.06 mL, 0.434 mmol) in N,N-dimethylformamide (0.5 mL) was added. The reaction mixture was stirred at room temperature for 6 h. To the solution was added dichloroethane (1 mL) and saturated aqueous NaHCO₃ solution. Upon separation, the aqueous phase was extracted with DCE (2×2 mL). The combined organic phases were dried over anhydrous MgSO₄, and concentrated to give a solid residue. To the material obtained was added potassium hydroxide (0.049 g, 0.869 mmol), hydroxylamine hydrochloride (0.03 g, 0.434 mmol) and MeOH (2 mL). The resulting mixture was heated at 80° C. with vigorous shaking for 1 h. Upon cooling to room temperature, acetic acid (65.9 μL, 1.16 mmol) (50% v/v in MeOH) was added and the solution was shaken at room temperature for an additional 10 min. The solvent was then completely evaporated, the solid residue was dissolved in DMSO (1.3 mL) and subjected to prep HPLC separation [238 nm, rt=5.59 min (12 min), 20-45% MeCN—H₂O gradient] to give the title compound (0.0188 g, 44.7%) as a white solid. LCMS: (FA) ES+ 291. ¹H NMR (MeOD, 300 MHz) δ 7.55

160

(m, 1H), 7.49 (dd, J=7.8, 1.8 Hz, 1H), 7.39 (d, J=7.8 Hz, 1H), 4.57 (br, 2H), 4.01 (br, 2H), 3.08 (br, 2H), 1.86 (br, 2H), 1.21 (s, 9H).

Example 87

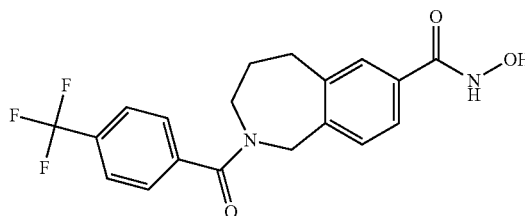
Synthesis of N-hydroxy-2-[(1-methyl-1H-pyrrol-2-yl)carbonyl]-2,3,4,5-tetrahydro-1H-2-benzazepine-7-carboxamide (Compound 83)



The title compound was prepared in an analogous fashion to that described in Example 86. Yield: 41.0%; Purification with Gilson prep-HPLC [228 nm, rt=5.36 (12 min), 20-40% gradient MeCN—H₂O]; LCMS: (FA) ES+ 314; ¹H NMR (MeOD, 300 MHz) δ 8.08 (s, 1H), 7.57 (s, 1H), 7.48 (m, 2H), 6.75 (m, 1H), 6.28 (m, 1H), 6.06 (m, 1H), 4.78 (s, 2H), 4.00 (br, 2H), 3.11 (br, 2H), 1.88 (br, 2H).

Example 88

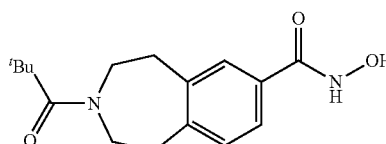
Synthesis of N-hydroxy-2-[4-(trifluoromethyl)benzoyl]-2,3,4,5-tetrahydro-1H-2-benzazepine-7-carboxamide (Compound 84)



The title compound was prepared in an analogous fashion to that described in Example 86. Yield: 35.8%; Purification with Gilson prep-HPLC [234 nm, rt=6.77 (12 min), 25-58% gradient MeCN—H₂O]; LCMS: (FA) ES+ 379; ¹H NMR (MeOD, 300 MHz) δ 7.77-7.34 (m, 7H), 4.81 (s, 1.4H), 4.51 (s, 0.6H), 4.05 (m, 0.6H), 3.68 (m, 1.4H), 3.08 (m, 2H), 1.96 (m, 0.6H), 1.74 (m, 1.4H).

Example 89

Synthesis of 3-(2,2-dimethylpropanoyl)-N-hydroxy-2,3,4,5-tetrahydro-1H-3-benzazepine-7-carboxamide (Compound 85)



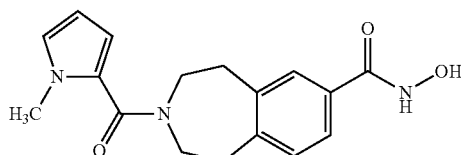
The title compound was prepared in an analogous fashion to that described in Example 86. Yield: 18.0%; Purification with Gilson prep-HPLC [216 nm, rt=5.46 (12 min), 20-40%

161

gradient MeCN—H₂O]; LCMS: (FA) ES+ 291; ¹H NMR (MeOD, 400 MHz) δ 8.07 (s, 1H), 7.51 (m, 2H), 7.23 (d, J=7.2 Hz, 1H), 3.75 (m, 4H), 3.02 (m, 4H), 1.25 (s, 9H).

Example 90

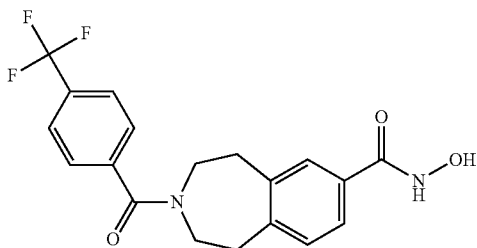
Synthesis of N-hydroxy-3-[(1-methyl-1H-pyrrol-2-yl)carbonyl]-2,3,4,5-tetrahydro-1H-3-benzazepine-7-carboxamide (Compound 86)



The title compound was prepared in an analogous fashion to that described in Example 86. Yield: 18.0%; Purification with Gilson prep-HPLC [208 nm, rt=5.24 (12 min), 18-38% gradient MeCN—H₂O]; LCMS: (FA) ES+ 314; ¹H NMR (MeOD, 400 MHz) δ 8.06 (s, 1H), 7.52 (m, 2H), 7.25 (d, J=7.8 Hz, 1H), 6.78 (m, 1H), 6.36 (m, 1H), 6.07 (m, 1H), 3.84 (m, 4H), 3.56 (s, 3H), 3.06 (m, 4H).

Example 91

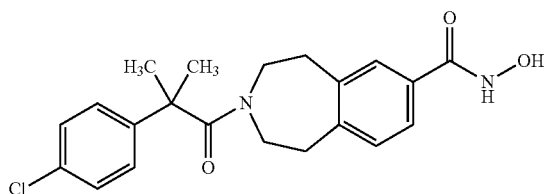
Synthesis of N-hydroxy-3-[4-(trifluoromethyl)benzoyl]-2,3,4,5-tetrahydro-1H-3-benzazepine-7-carboxamide (Compound 87)



The title compound was prepared in an analogous fashion to that described in Example 86. Yield: 20.0%; Purification with Gilson prep-HPLC [218 nm, rt=6.62 (12 min), 25-58% gradient MeCN—H₂O]; LCMS: (FA) ES+ 379.

Example 92

Synthesis of 3-[2-(4-chlorophenyl)-2-methylpropanoyl]-N-hydroxy-2,3,4,5-tetrahydro-1H-3-benzazepine-7-carboxamide (Compound 88)



The title compound was prepared in an analogous fashion to that described in Example 86. Yield: 18.4%; Purification with Gilson prep-HPLC [222 nm, rt=7.23 (12 min), 30-60% gradient MeCN—H₂O]; LCMS: (FA) ES+ 388; ¹H NMR

162

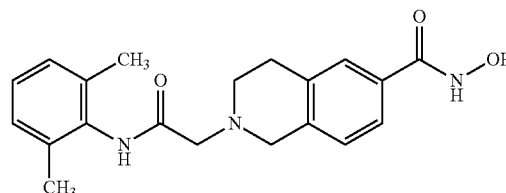
(MeOD, 400 MHz) δ 8.10 (s, 1H), 7.50-6.99 (m, 7H), 3.70 (br, 2H), 3.25 (br, 2H), 3.01 (br, 2H), 2.52 (br, 2H), 1.49 (s, 6H).

Example 93

Synthesis of 2-{2-[(2,6-dimethylphenyl)amino]-2-oxoethyl}-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide (Compound 116)

10

15



20

The title compound was prepared in a fashion analogous to that described in Example 57. Yield: 12.3%; LCMS: (FA) ES+ 354.

Example 94

Synthesis of N⁶-hydroxy-N²-[3-(trifluoromethyl)phenyl]-3,4-dihydroisoquinoline-2,6(1H)-dicarboxamide (Compound 98)

25

30

35

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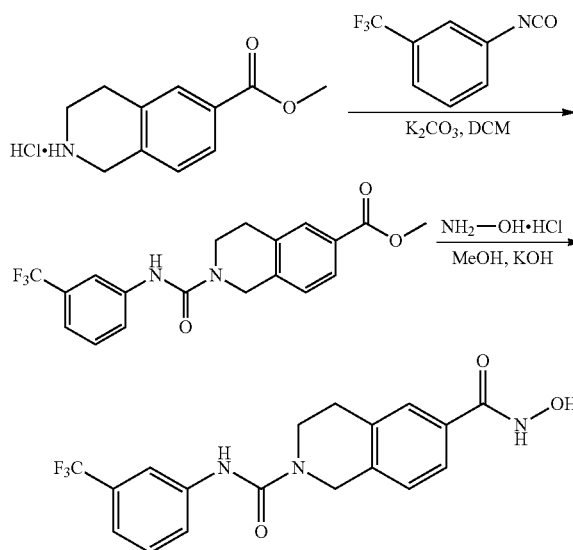
45

50

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60

65



Step 1: To a mixture of 6-methoxycarbonyl-1,2,3,4-tetrahydroisoquinoline hydrochloride (22.8 mg, 0.1 mmol), DCM (1 mL) and 1.0 M aqueous solution of potassium carbonate (1 mL, 1 mmol) was added (trifluoromethyl)phenyl isocyanate (47 mg, 0.25 mmol). The reaction mixture was stirred at room temperature overnight. Upon quenching with the addition of 0.5 mL of 1:1 MeOH:water, the mixture was stirred for an addition 30 minutes then evaporated to dryness. The residue obtained was partitioned between DCE (3×5 mL) and half saturated aqueous sodium bicarbonate. The organic layers were washed with brine and concentrated to afford a white solid. LCMS (FA) ES+ 379.

Step 2: To a solution of methyl 2-(3-(trifluoromethyl)phenyl)carbamoyl-1,2,3,4-tetrahydroisoquinoline-6-carboxylate (obtained in step 1) in methanol (1 mL) was added hydroxylamine hydrochloride (40 mg, 0.5 mmol) and potassium hydroxide (100 mg, 2 mmol). The reactions were left to

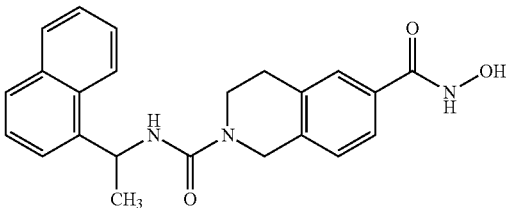
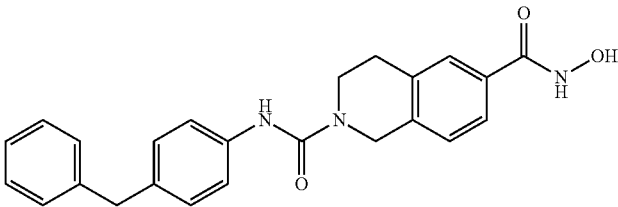
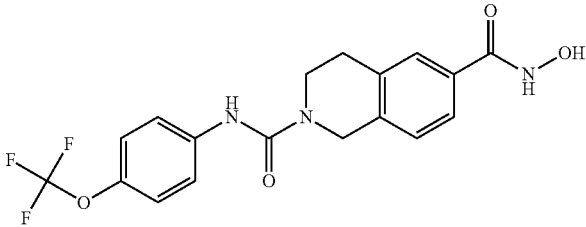
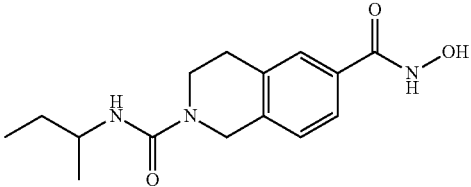
163

stir for 2 hours at 80° C. Upon cooling to room temperature, the reaction was quenched with the addition of formic acid (75 μ L, 2 mmol) and the solvents were evaporated to dryness. The residue obtained was dissolved in DMSO (1 mL), the residual solids removed by filtration and the solution purified via Gilson prep-HPLC to afford a white solid (4.2 mg, 11% over 2 steps). LCMS (FA) ES+ 380.

164

Example 95

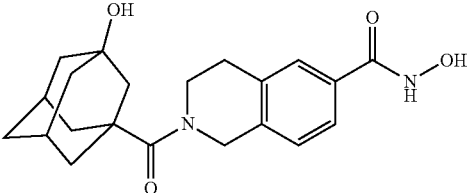
The following compounds were prepared in a fashion analogous to that described in Example 94 starting from the intermediates which were prepared as described above and the corresponding carboxylic acids.

Compound	Structure	LC-MS (FA)
103		ES+ 390
99		ES+ 402
92		ES+ 396
93		ES+ 291

50

Example 96

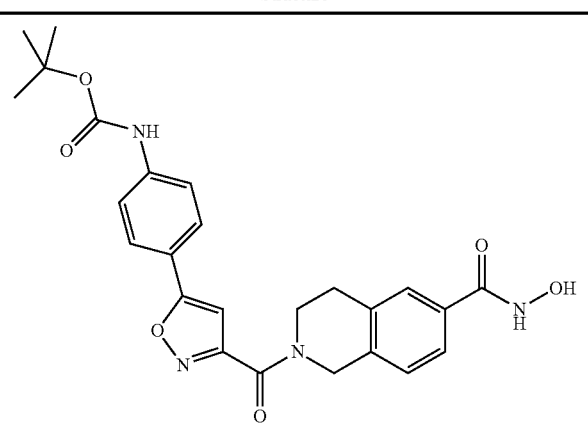
The following compound was prepared in a fashion analogous to that described in Example 1 employing the corresponding carboxylic acids.

Compound	Structure	LC-MS (FA)
		ES+ 371

165

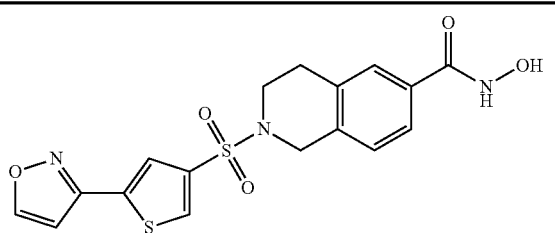
-continued

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Compound	Structure	LC-MS (FA)
		ES+ 391

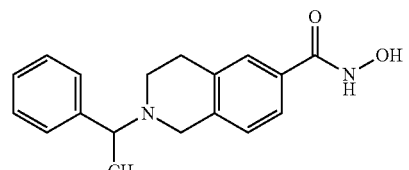
Example 97

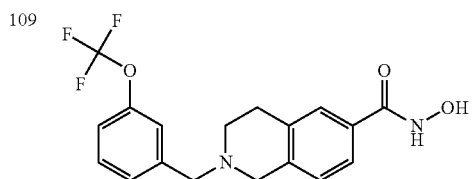
The following compound was prepared in a fashion analogous to that described in Example 38 employing the corresponding sulfonyl chloride.

Compound	Structure	LC-MS (FA)
112		ES+ 406

Example 98

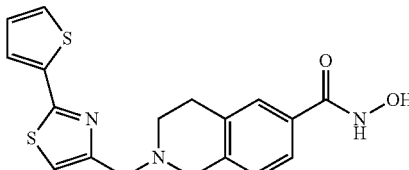
The following compounds were prepared in a fashion analogous to that described in Example 38 starting from the intermediates which were prepared as described above and the corresponding alkyl bromides.

Compound	Structure	LC-MS (FA)
110		ES+ 297



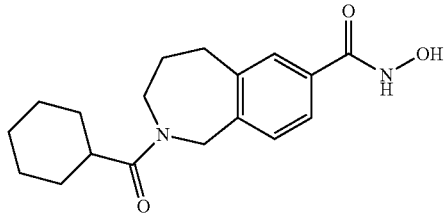
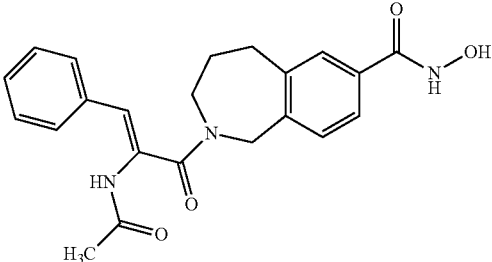
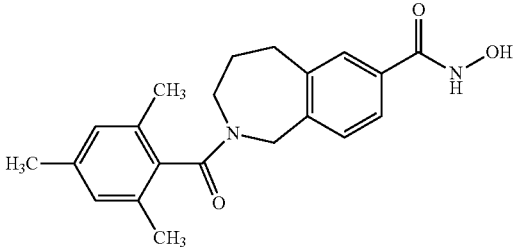
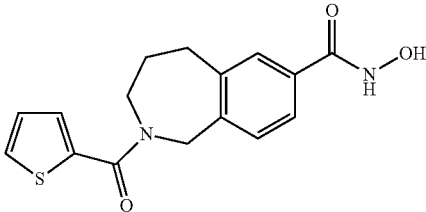
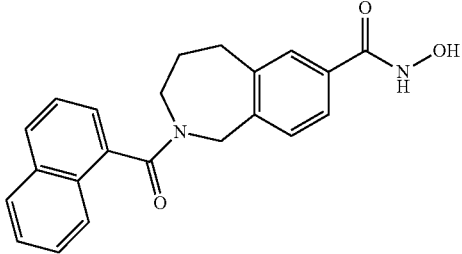
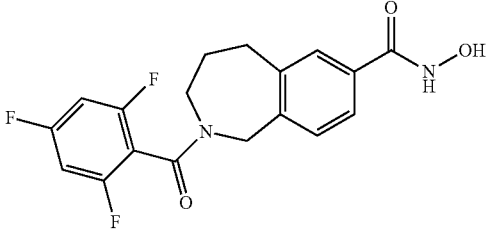
ES+ 367

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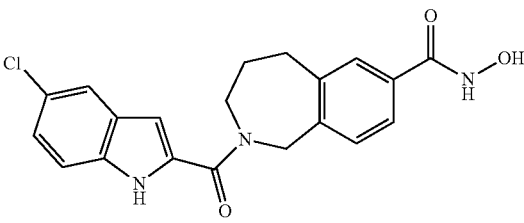
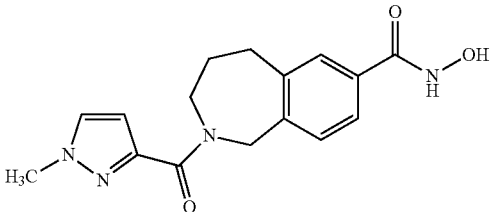
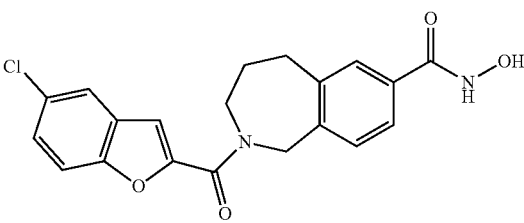
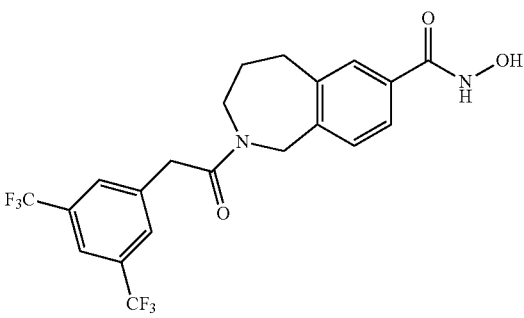
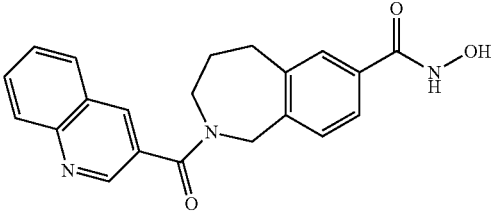
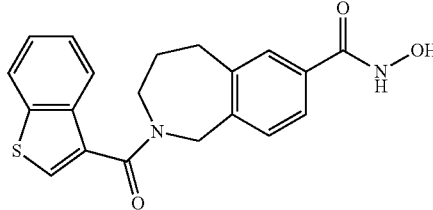
Compound	Structure	LC-MS (FA)
108		ES+ 372

Example 99

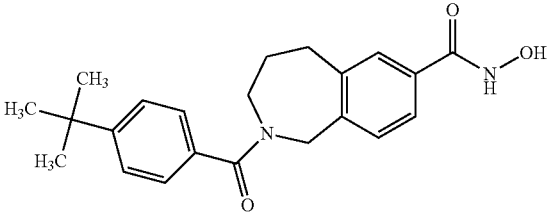
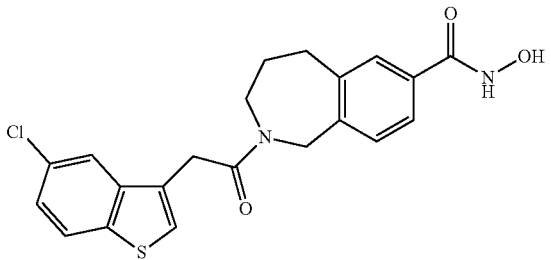
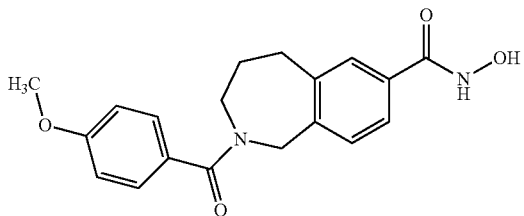
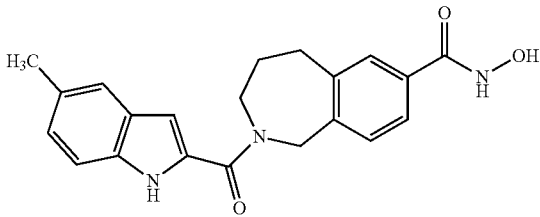
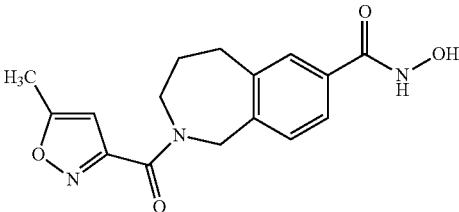
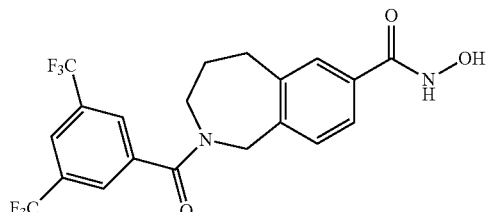
The following compounds were prepared in a fashion analogous to that described in Example 86 starting from the intermediates which were prepared as described above and the corresponding carboxylic acids.

Compound	Structure	LC-MS (FA)
247		ES+ 317
254		ES+ 394
259		ES+ 353
260		ES+ 317
234		ES+ 361
241		ES+ 365

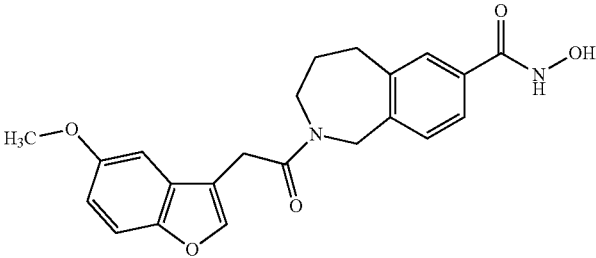
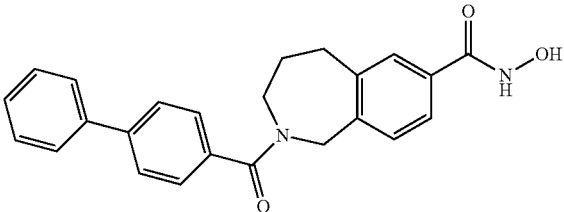
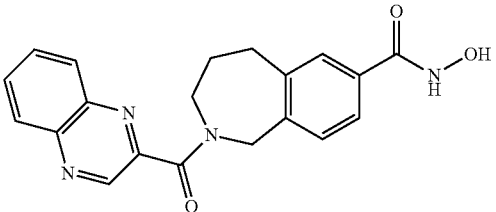
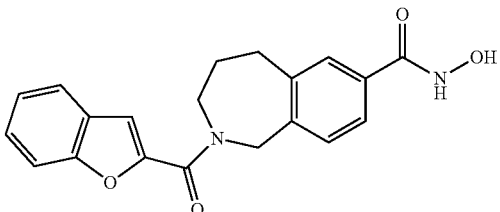
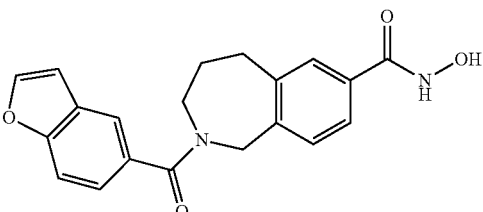
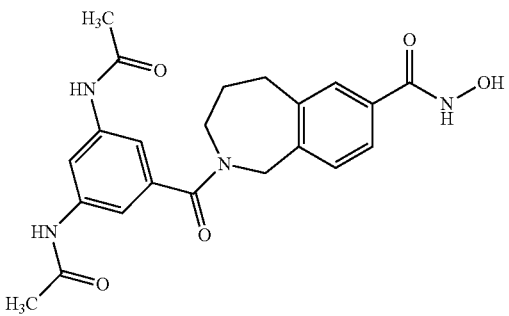
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Compound	Structure	LC-MS (FA)
240		ES+ 384
233		ES+ 315
257		ES+ 385
236		ES+ 461
255		ES+ 362
258		ES+ 367

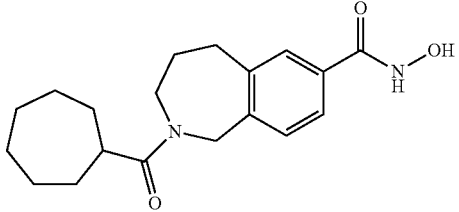
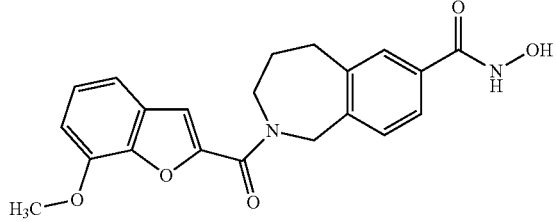
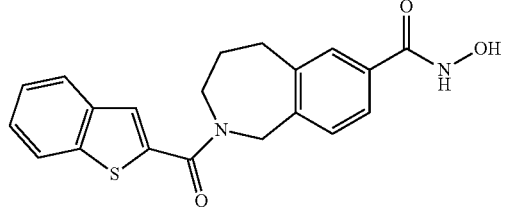
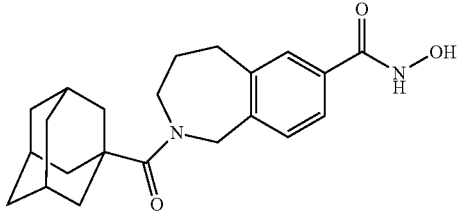
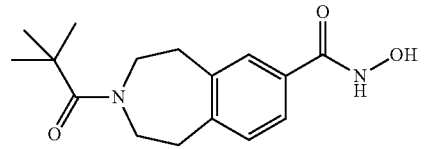
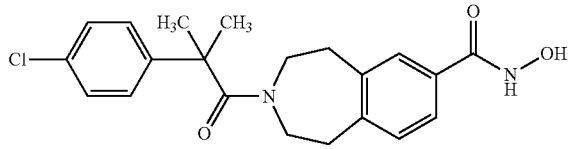
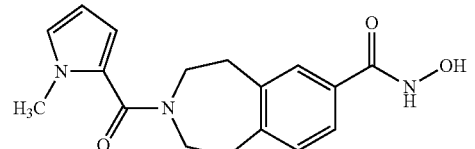
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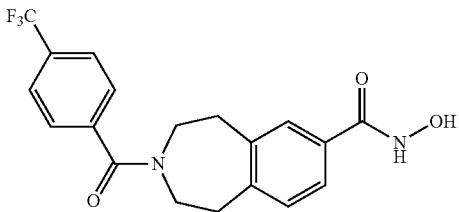
Compound	Structure	LC-MS (FA)
238		ES+ 367
251		ES+ 415
235		ES+ 341
253		ES+ 364
245		ES+ 316
261		ES+ 447

-continued

Compound	Structure	LC-MS (FA)
249		ES+ 395
244		ES+ 387
243		ES+ 363
250		ES+ 351
252		ES+ 351
256		ES+ 425

-continued

Compound	Structure	LC-MS (FA)
246		ES+ 331
242		ES+ 382
239		ES+ 368
232		ES+ 369
85		ES+ 291
88		ES+ 387
86		ES+ 314

Compound	Structure	LC-MS (FA)
87		ES+ 379

Example 100

HDAC6 Enzyme Assay

To measure the inhibition of HDAC6 activity, purified human HDAC6 (BPS Bioscience; Cat. No. 5006) is incubated with substrate Ac-Arg-Gly-Lys(Ac)-AMC peptide (Bachem Biosciences; Cat. No. I-1925) for 1 hour at 30° C. in the presence of test compounds or vehicle DMSO control. The reaction is stopped with the HDAC inhibitor trichostatin A (Sigma; Cat. No. T8552) and the amount of Arg-Gly-Lys-AMC generated is quantitated by digestion with trypsin (Sigma; Cat. No. T1426) and subsequent measurement of the amount of AMC released using a fluorescent plate reader (Pherastar; BMG Technologies) set at Ex 340 nm and Em 460 nm. Concentration response curves are generated by calculating the fluorescence increase in test compound-treated samples relative to DMSO-treated controls, and enzyme inhibition (IC₅₀) values are determined from those curves.

Example 101

Nuclear Extract HDAC Assay

As a screen against Class I HDAC enzymes, HeLa nuclear extract (BIOMOL; Cat. No. KI-140) is incubated with Ac-Arg-Gly-Lys(Ac)-AMC peptide (Bachem Biosciences; Cat. No. I-1925) in the presence of test compounds or vehicle DMSO control. The HeLa nuclear extract is enriched for Class I enzymes HDAC1, -2 and -3. The reaction is stopped with the HDAC inhibitor Trichostatin A (Sigma; Cat. No. T8552) and the amount of Arg-Gly-Lys-AMC generated is quantitated by digestion with trypsin (Sigma; Cat. No. T1426) and subsequent measurement of the amount of AMC released using a fluorescent plate reader (Pherastar; BMG Technologies) set at Ex 340 nm and Em 460 nm. Concentration response curves are generated by calculating the fluorescence increase in test compound-treated samples relative to DMSO-treated controls, and enzyme inhibition (IC₅₀) values are determined from those curves.

Example 102

Western Blot and Immunofluorescence Assays

Cellular potency and selectivity of compounds are determined using a published assay (Haggarty et al., *Proc. Natl. Acad. Sci. USA* 2003, 100 (8): 4389-4394) using HeLa cells (ATCC cat#CCL-2™) which are maintained in MEM medium (Invitrogen) supplemented with 10% FBS; or multiple myeloma cells RPMI-8226 (ATCC cat#CCL-155™) which are maintained in RPMI 1640 medium (Invitrogen) supplemented with 10% FBS. Briefly, cells are treated with

inhibitors for 6 or 24 h and either lysed for Western blotting, or fixed for immunofluorescence analyses. HDAC6 potency is determined by measuring K40 hyperacetylation of alpha-tubulin with an acetylation selective monoclonal antibody (Sigma cat#T7451) in IC₅₀ experiments. Selectivity against Class I HDAC activity is determined similarly using an antibody that recognizes hyperacetylation of histone H4 (Upstate cat#06-866) in the Western blotting assay or nuclear acetylation (Abcam cat#ab21623) in the immunofluorescence assay.

Example 103

In Vivo Tumor Efficacy Model

Female NCr-Nude mice (age 6-8 weeks, Charles River Labs) are aseptically injected into the subcutaneous space in the right dorsal flank with 1.0-5.0×10⁶ cells (SKOV-3, HCT-116, BxPC3) in 100 μL of a 1:1 ratio of serum-free culture media (Sigma Aldrich) and BD Matrigel™ (BD Biosciences) using a 1 mL 26½ gauge needle (Becton Dickinson Ref#309625). Alternatively, some xenograft models require the use of more immunocompromised strains of mice such as CB-17 SCID (Charles River Labs) or NOD-SCID (Jackson Laboratory). Furthermore, some xenograft models require serial passaging of tumor fragments in which small fragments of tumor tissue (approximately 1 mm³) are implanted subcutaneously in the right dorsal flank of anesthetized (3-5% isoflurane/oxygen mixture) NCr-Nude, CB-17 SCID or NOD-SCID mice (age 5-8 weeks, Charles River Labs or Jackson Laboratory) via a 13-ga trocar needle (Popper & Sons 7927). Tumor volume is monitored twice weekly with Vernier calipers. The mean tumor volume is calculated using the formula $V=W^2 \times L/2$. When the mean tumor volume is approximately 200 mm³, the animals are randomized into treatment groups of ten animals each. Drug treatment typically includes the test compound as a single agent, and may include combinations of the test compound and other anti-cancer agents. Dosing and schedules are determined for each experiment based on previous results obtained from pharmacokinetic/pharmacodynamic and maximum tolerated dose studies. The control group will receive vehicle without any drug. Typically, test compound (100-200 μL) is administered via intravenous (27-ga needle), oral (20-ga gavage needle) or subcutaneous (27-ga needle) routes at various doses and schedules. Tumor size and body weight are measured twice a week and the study is terminated when the control tumors reach approximately 2000 mm³, and/or if tumor volume exceeds 10% of the animal body weight or if the body weight loss exceeds 20%.

The differences in tumor growth trends over time between pairs of treatment groups are assessed using linear mixed effects regression models. These models account for the fact that each animal is measured at multiple time points. A sepa-

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rate model is fit for each comparison, and the areas under the curve (AUC) for each treatment group are calculated using the predicted values from the model. The percent decrease in AUC (dAUC) relative to the reference group is then calculated. A statistically significant P value suggests that the trends over time for the two treatment groups are different.

The tumor measurements observed on a date pre-specified by the researcher (typically the last day of treatment) are analyzed to assess tumor growth inhibition. For this analysis, a T/C ratio is calculated for each animal by dividing the tumor measurement for the given animal by the mean tumor measurement across all control animals. The T/C ratios across a treatment group are compared to the T/C ratios of the control group using a two-tailed Welch's t-test. To adjust for multiplicity, a False Discovery Rate (FDR) is calculated for each comparison using the approach described by Benjamini and Hochberg, *J.R. Stat. Soc. B* 1995, 57:289-300.

As detailed above, compounds of the invention inhibit HDAC6. In certain embodiments, compounds of the invention inhibit HDAC6 with an IC50 value of less than 50 nM including compounds: 1, 4, 7, 8, 25, 27, 30, 32, 33, 47, 49, 72, 75, 77, 78, 79, 80, 88, 89, 90, 91, 92, 93, 94, 95, 96, 98, 99, 100, 101, 102, 103, 104, 105, 239, 240, 242, 248, 250, 253.

In certain embodiments, compounds of the invention inhibit HDAC6 with an IC50 value of greater than 50 nM and less than 100 nM including compounds: 2, 3, 5, 9, 10, 12, 14, 15, 16, 18, 19, 21, 22, 23, 29, 34, 38, 39, 43, 44, 45, 48, 52, 54, 57, 58, 60, 71, 73, 76, 81, 97, 116, 237, 257.

In certain embodiments, compounds of the invention inhibit HDAC6 with an IC50 value of greater than 100 nM and less than 500 nM including compounds: 6, 17, 20, 24, 26, 28, 31, 35, 36, 37, 40, 42, 50, 51, 53, 55, 56, 59, 61, 62, 63, 64, 65, 66, 67, 68, 69, 82, 83, 85, 86, 87, 106, 109, 110, 111, 112, 232, 234, 235, 238, 241, 243, 244, 245, 246, 247, 249, 251, 252, 254, 255, 256, 258, 260.

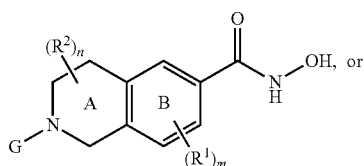
In certain embodiments, compounds of the invention inhibit HDAC6 with an IC50 value of greater than 500 nM including compounds: 13, 74, 84, 233, 236, 259, 261.

As detailed above, compounds of the invention are selective for HDAC6 over other Class I HDAC enzymes. In some embodiments, the ratio of HDAC IC50 (as obtained in the nuclear extract assay described above) to HDAC6 IC50 is 10:1. In certain embodiments, the ratio of HDAC IC50 to HDAC6 IC50 is 100:1. In certain embodiments, the ratio of HDAC IC50 to HDAC6 IC50 is 1000:1.

While we have described a number of embodiments of this invention, it is apparent that our basic examples may be altered to provide other embodiments, which utilize the compounds and methods of this invention. Therefore, it will be appreciated that the scope of this invention is to be defined by the appended claims rather than by the specific embodiments, which have been represented by way of examples.

What is claimed is:

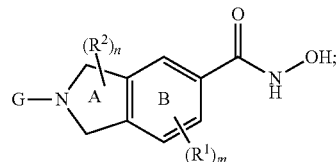
1. A compound of formula (II-A) or (II-B):



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-continued

(II-B)



or a pharmaceutically acceptable salt thereof;

wherein:

G is $-R^3$, $-V_1-R^3$, $-V_1-L_1-R^3$, $-L_1-V_2-R^3$, $-L_1-R^3$, or $-L_1-V_2-L_2-R^3$;

L_1 and L_2 are each independently a C_{1-3} alkylene chain substituted with 0-2 occurrences of R^{8a} , where one carbon atom in the C_{1-3} alkylene chain may be replaced with $-CR^4=CR^4-$;

each occurrence of R^{8a} is independently halogen, C_{1-4} aliphatic, $-CN$, $-NO_2$, $-N(R^{5b})_2$, $-OR^{5b}$, $-SR^{5c}$, $-S(O)_2R^{5c}$, $-S(O)R^{5c}$, $-C(O)R^{5b}$, $-C(O)OR^{5b}$, $-C(O)N(R^{5b})_2$, $-S(O)_2N(R^{5b})_2$, $-OC(O)N(R^{5b})_2$, $-N(R^{5e})C(O)R^{5b}$, $-N(R^{5e})SO_2R^{5c}$, $-N(R^{5e})C(O)OR^{5b}$, $-N(R^{5e})C(O)N(R^{5b})_2$, $-N(R^{5e})SO_2N(R^{5b})_2$, or a C_{1-4} aliphatic substituted with halogen, $-CN$, $-NO_2$, $-N(R^{5b})_2$, $-OR^{5b}$, $-SR^{5c}$, $-S(O)_2R^{5c}$, $-S(O)R^{5c}$, $-C(O)R^{5b}$, $-C(O)OR^{5b}$, $-C(O)N(R^{5b})_2$, $-S(O)_2N(R^{5b})_2$, $-OC(O)N(R^{5b})_2$, $-N(R^{5e})C(O)R^{5b}$, $-N(R^{5e})SO_2R^{5c}$, $-N(R^{5e})C(O)OR^{5b}$, $-N(R^{5e})C(O)N(R^{5b})_2$, or $-N(R^{5e})SO_2N(R^{5b})_2$;

each occurrence of R^{5b} is independently hydrogen or an optionally substituted group selected from C_{1-6} aliphatic, 3-10-membered cycloaliphatic, 4-10-membered saturated or partially unsaturated heterocyclyl having 1-4 heteroatoms independently selected from nitrogen, oxygen, and sulfur, 6-10-membered aryl, or 5-10-membered heteroaryl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur; or two occurrences of R^{5b} on the same nitrogen atom can be taken together with the nitrogen atom to which they are bound to form an optionally substituted 4-7-membered heterocyclyl ring having 0-1 additional heteroatoms selected from nitrogen, oxygen, and sulfur;

each occurrence of R^{5c} is an optionally substituted group selected from C_{1-6} aliphatic, 3-10-membered cycloaliphatic, 4-10-membered saturated or partially unsaturated heterocyclyl having 1-4 heteroatoms independently selected from the nitrogen, oxygen, and sulfur, 6-10-membered aryl, or 5-10-membered heteroaryl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur;

each occurrence of R^{5e} is hydrogen or an optionally substituted C_{1-6} aliphatic group;

V_1 is $-S(O)_2-$;

V_2 is $-C(O)-$, $-C(S)-$, $-N(R^{4a})-$, $-C(O)-N(R^{4a})-$, $-N(R^{4a})-C(O)-$, $-SO_2-N(R^{4a})-$, $-N(R^{4a})-SO_2-$, $-C(O)-O-$, $-O-C(O)-$, $-O-$, $-S-$, $-S(O)-$, $-S(O)_2-$, $-N(R^{4a})-C(O)-N(R^{4a})-$, $-N(R^{4a})-C(O)-O-$, $-O-C(O)-N(R^{4a})-$, or $-N(R^{4a})-SO_2-N(R^{4a})-$;

R^3 is unsubstituted or substituted C_{1-6} aliphatic, unsubstituted or substituted 3-10-membered cycloaliphatic, unsubstituted or substituted 4-10-membered saturated or partially unsaturated heterocyclyl having 1-4 heteroatoms independently selected from nitrogen, oxygen, and sulfur, unsubstituted or substituted 6-10-membered aryl, or unsubstituted or substituted 5-10-membered het-

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eroaryl having 1-4 heteroatoms independently selected from nitrogen, oxygen, and sulfur;

R³ when substituted is substituted with 1-4 independent occurrences of —R⁵, wherein R⁵ is —R^{5a}, —R^{5d}, —L₃—R^{5d}, or —V₃—L₃—R^{5d};

each occurrence of R^{5a} is independently halogen, C₁₋₃aliphatic, —CN, —NO₂, —N(R^{5b})₂, —OR^{5b}, —SR^{5c}, —S(O)₂R^{5c}, —S(O)R^{5c}, —C(O)R^{5b}, —C(O)OR^{5b}, —C(O)N(R^{5b})₂, —S(O)₂N(R^{5b})₂, —OC(O)N(R^{5b})₂, —N(R^{5e})C(O)R^{5b}, —N(R^{5e})SO₂R^{5c}, —N(R^{5e})C(O)OR^{5b}, —N(R^{5e})C(O)N(R^{5b})₂, or —N(R^{5e})SO₂N(R^{5b})₂, or a C₁₋₄ aliphatic substituted with R^{5dd}, halogen, —CN, —NO₂, —N(R^{5b})₂, —OR^{5b}, —SR^{5c}, —S(O)₂R^{5c}, —S(O)R^{5c}, —C(O)R^{5b}, —C(O)OR^{5b}, —C(O)N(R^{5b})₂, —S(O)₂N(R^{5b})₂, —OC(O)N(R^{5b})₂, —N(R^{5e})C(O)R^{5b}, —N(R^{5e})SO₂R^{5c}, —N(R^{5e})C(O)OR^{5b}, —N(R^{5e})C(O)N(R^{5b})₂, or —N(R^{5e})SO₂N(R^{5b})₂;

each occurrence of R^{5b} is independently hydrogen or an optionally substituted group selected from C¹⁻⁶aliphatic, 3-10-membered cycloaliphatic, 4-10-membered saturated or partially unsaturated heterocyclyl having 1-4 heteroatoms independently selected from nitrogen, oxygen, and sulfur, 6-10-membered aryl, or 5-10-membered heteroaryl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur; or two occurrences of R^{5b} on the same nitrogen atom can be taken together with the nitrogen atom to which they are bound to form an optionally substituted 4-7-membered saturated or partially unsaturated heterocyclyl ring having 0-1 additional heteroatoms selected from nitrogen, oxygen, and sulfur;

each occurrence of R^{5c} is independently an optionally substituted group selected from C₁₋₆ aliphatic, 3-10-membered cycloaliphatic, 4-10-membered saturated or partially unsaturated heterocyclyl having 1-4 heteroatoms independently selected from nitrogen, oxygen, and sulfur, 6-10-membered aryl, or 5-10-membered heteroaryl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur;

each occurrence of R^{5d} is an optionally substituted group selected from 6-10-membered aryl, or 5-10-membered heteroaryl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur;

each occurrence of R^{5e} is independently hydrogen or an optionally substituted C₁₋₆ aliphatic group;

each occurrence of V₃ is independently —N(R^{5e}), —O—, —S—, —S(O)—, —S(O)₂—, —C(O)—, —C(O)O—, —C(O)N(R^{5e})—, —S(O)₂N(R^{5e})—, —OC(O)N(R^{5e})—, —N(R^{5e})C(O)—, —N(R^{5e})SO₂—, —N(R^{5e})C(O)O—, —N(R^{5e})C(O)N(R^{5e})—, —N(R^{5e})SO₂N(R^{5e})—, —OC(O)—, or —C(O)N(R^{5e})O—;

L₃ is an optionally substituted C₁₋₃alkylene chain, where one carbon atom may be replaced with —CR⁴=CR⁴—;

each occurrence of R⁴ is independently hydrogen, halo, or an optionally substituted C₁₋₄ aliphatic group;

each occurrence of R^{4a} is independently hydrogen, or an optionally substituted C₁₋₄ aliphatic group;

ring B is optionally further substituted with m occurrences of R¹;

each occurrence of R¹ is independently halo, C₁₋₃alkyl, C₁₋₃haloalkyl, —O—C₁₋₃alkyl, —O—C₁₋₃ haloalkyl, —CN, —NHC(O)C₁₋₃alkyl, —NHC(O)NHC₁₋₃alkyl, or NHS(O)₂C₁₋₃alkyl;

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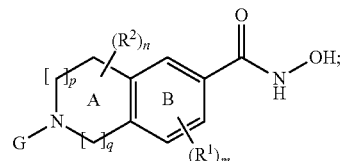
ring A is optionally further substituted with n occurrences of R²;

each occurrence of R² is independently halo, C₁₋₃alkyl, C₁₋₃haloalkyl, —O—C₁₋₃alkyl, —O—C₁₋₃ haloalkyl, —NHC(O)C₁₋₃alkyl, —NHC(O)NHC₁₋₃alkyl, or NHS(O)₂C₁₋₃alkyl;

m is 0-2; and

n is 0-4.

2. A compound of formula (I):



(I)

or a pharmaceutically acceptable salt thereof;

wherein:

p is 0 and q is 1; or p is 1 and q is 1;

G is —R³, —V₁—R³, —V₁—L₁—R³, —L₁—V₁—R³, —L₂—V₂—R³, —V₁—L₁—V₂—R³, or —L₁—R³;

L₁ is C₁₋₃alkylene chain, optionally substituted with 0-2 occurrences of R^{8a} where one carbon atom in the C₁₋₃alkylene chain may be replaced with —CR⁴=CR⁴;

L₂ is C₂₋₃alkylene chain, optionally substituted with 0-2 occurrences of R^{8a} where one carbon atom in the C₁₋₃alkylene chain may be replaced with —CR⁴=CR⁴;

each occurrence of R^{8a} is independently halogen, C₁₋₄aliphatic, —CN, —NO₂, —N(R^{5b})₂, —OR^{5b}, —SR^{5c}, —S(O)₂R^{5c}, —S(O)R^{5c}, —C(O)R^{5b}, —C(O)OR^{5b}, —C(O)N(R^{5b})₂, —S(O)₂N(R^{5b})₂, —OC(O)N(R^{5b})₂, —N(R^{5e})C(O)R^{5b}, —N(R^{5e})SO₂R^{5c}, —N(R^{5e})C(O)OR^{5b}, —N(R^{5e})C(O)N(R^{5b})₂, or —N(R^{5e})SO₂N(R^{5b})₂, or a C₁₋₄ aliphatic substituted with halogen, —CN, —NO₂, —N(R^{5b})₂, —OR^{5b}, —SR^{5c}, —S(O)₂R^{5c}, —S(O)R^{5c}, —C(O)R^{5b}, —C(O)OR^{5b}, —C(O)N(R^{5b})₂, —S(O)₂N(R^{5b})₂, —OC(O)N(R^{5b})₂, —N(R^{5e})C(O)R^{5b}, —N(R^{5e})SO₂R^{5c}, —N(R^{5e})C(O)OR^{5b}, —N(R^{5e})C(O)N(R^{5b})₂, or —N(R^{5e})SO₂N(R^{5b})₂;

each occurrence of R^{5b} is independently hydrogen or an optionally substituted group selected from C₁₋₆ aliphatic, 3-10-membered cycloaliphatic, 4-10-membered saturated or partially unsaturated heterocyclyl having 1-4 heteroatoms independently selected from nitrogen, oxygen, and sulfur, 6-10-membered aryl, or 5-10-membered heteroaryl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur; or two occurrences of R^{5b} on the same nitrogen atom can be taken together with the nitrogen atom to which they are bound to form an optionally substituted 4-7-membered heterocyclyl ring having 0-1 additional heteroatoms selected from nitrogen, oxygen, and sulfur;

each occurrence of R^{5c} is an optionally substituted group selected from C₁₋₆ aliphatic, 3-10-membered cycloaliphatic, 4-10-membered saturated or partially unsaturated heterocyclyl having 1-4 heteroatoms independently selected from nitrogen, oxygen, and sulfur, 6-10-membered aryl, or 5-10-membered heteroaryl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur;

each occurrence of R^{5d} is an optionally substituted group selected from 6-10-membered aryl, or 5-10-membered heteroaryl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur;

each occurrence of R^{5e} is independently hydrogen or an optionally substituted C₁₋₆ aliphatic group;

V₁ is —C(S)— or —S(O)₂—;

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V_2 is $-\text{C}(\text{O})-$, $-\text{C}(\text{S})-$, $-\text{N}(\text{R}^{4a})-$, $-\text{C}(\text{O})-\text{N}(\text{R}^{4a})-$, $-\text{N}(\text{R}^{4a})-\text{C}(\text{O})-$, $-\text{SO}_2-\text{N}(\text{R}^{4a})-$, $-\text{N}(\text{R}^{4a})-\text{SO}_2-$, $-\text{C}(\text{O})-\text{O}-$, $-\text{O}-\text{C}(\text{O})-$, $-\text{O}-$, $-\text{S}-$, $-\text{S}(\text{O})-$, $-\text{S}(\text{O})_2-$, $-\text{N}(\text{R}^{4a})-\text{C}(\text{O})-\text{N}(\text{R}^{4a})-$, $-\text{N}(\text{R}^{4a})-\text{C}(\text{O})-\text{O}-$, $-\text{O}-\text{C}(\text{O})-\text{N}(\text{R}^{4a})-$, or $-\text{N}(\text{R}^{4a})-\text{SO}_2-\text{N}(\text{R}^{4a})-$; 5

R^3 is unsubstituted or substituted C_{1-6} aliphatic, unsubstituted or substituted 3-10-membered cycloaliphatic, unsubstituted or substituted 4-10-membered saturated or partially unsaturated heterocyclyl having 1-4 heteroatoms independently selected from nitrogen, oxygen, and sulfur, unsubstituted or substituted 6-10-membered aryl, or unsubstituted or substituted 5-10-membered heteroaryl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur; 10

R^3 when substituted is substituted with 1-4 independent occurrences of $-\text{R}^5$, wherein R^5 is $-\text{R}^{5a}$, $-\text{R}^{5d}$, $-\text{L}_3-\text{R}^{5d}$, or $-\text{V}_3-\text{L}_3-\text{R}^{5d}$; 15

each occurrence of R^{5a} is independently halogen, C_{1-3} aliphatic, $-\text{CN}$, $-\text{NO}_2$, $-\text{N}(\text{R}^{5b})_2$, $-\text{OR}^{5b}$, $-\text{SR}^{5c}$, $-\text{S}(\text{O})_2\text{R}^{5c}$, $-\text{S}(\text{O})\text{R}^{5c}$, $-\text{C}(\text{O})\text{R}^{5b}$, $-\text{C}(\text{O})\text{OR}^{5b}$, $-\text{C}(\text{O})\text{N}(\text{R}^{5b})_2$, $-\text{S}(\text{O})_2\text{N}(\text{R}^{5b})_2$, $-\text{OC}(\text{O})\text{N}(\text{R}^{5b})_2$, $-\text{N}(\text{R}^{5e})\text{C}(\text{O})\text{R}^{5b}$, $-\text{N}(\text{R}^{5e})\text{SO}_2\text{R}^{5c}$, $-\text{N}(\text{R}^{5e})\text{C}(\text{O})\text{OR}^{5b}$, $-\text{N}(\text{R}^{5e})\text{C}(\text{O})\text{N}(\text{R}^{5b})_2$, or $-\text{N}(\text{R}^{5e})\text{SO}_2\text{N}(\text{R}^{5b})_2$, 25

or a C_{1-4} aliphatic substituted with R^{5dd} , halogen, $-\text{CN}$, $-\text{NO}_2$, $-\text{N}(\text{R}^{5b})_2$, $-\text{OR}^{5b}$, $-\text{SR}^{5c}$, $-\text{S}(\text{O})_2\text{R}^{5c}$, $-\text{S}(\text{O})\text{R}^{5c}$, $-\text{C}(\text{O})\text{R}^{5b}$, $-\text{C}(\text{O})\text{OR}^{5b}$, $-\text{C}(\text{O})\text{N}(\text{R}^{5b})_2$, $-\text{S}(\text{O})_2\text{N}(\text{R}^{5b})_2$, $-\text{OC}(\text{O})\text{N}(\text{R}^{5b})_2$, $-\text{N}(\text{R}^{5e})\text{C}(\text{O})\text{R}^{5b}$, $-\text{N}(\text{R}^{5e})\text{SO}_2\text{R}^{5c}$, $-\text{N}(\text{R}^{5e})\text{C}(\text{O})\text{OR}^{5b}$, $-\text{N}(\text{R}^{5e})\text{C}(\text{O})\text{N}(\text{R}^{5b})_2$, or $-\text{N}(\text{R}^{5e})\text{SO}_2\text{N}(\text{R}^{5b})_2$; 30

each occurrence of R^{5b} is independently hydrogen or an optionally substituted group selected from C^{1-6} aliphatic, 3-10-membered cycloaliphatic, 4-10-membered saturated or partially unsaturated heterocyclyl having 1-4 heteroatoms independently selected from nitrogen, oxygen, and sulfur, 6-10-membered aryl, or 5-10-membered heteroaryl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur; or two occurrences of R^{5b} on the same nitrogen atom can be taken together with the nitrogen atom to which they are bound to form an optionally substituted 4-7-membered saturated or partially unsaturated heterocyclyl ring having 0-1 additional heteroatoms selected from nitrogen, oxygen, and sulfur; 35

each occurrence of R^{5c} is independently an optionally substituted group selected from C_{1-6} aliphatic, 3-10-membered cycloaliphatic, 4-10-membered saturated or partially unsaturated heterocyclyl having 1-4 heteroatoms independently selected from nitrogen, oxygen, and sulfur, 6-10-membered aryl, or 5-10-membered heteroaryl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur; 40

each occurrence of R^{5d} is an optionally substituted group selected from 6-10-membered aryl, or 5-10-membered heteroaryl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur; 45

each occurrence of R^{5dd} is an optionally substituted group selected from 6-10-membered aryl, or 5-10-membered heteroaryl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur; 50

each occurrence of R^{5e} is independently hydrogen or an optionally substituted C_{1-6} aliphatic group; 55

each occurrence of V_3 is independently $-\text{N}(\text{R}^{5e})$, $-\text{O}-$, $-\text{S}-$, $-\text{S}(\text{O})-$, $-\text{S}(\text{O})_2-$, $-\text{C}(\text{O})-$, $-\text{C}(\text{O})\text{O}-$, $-\text{C}(\text{O})\text{N}(\text{R}^{5e})-$, $-\text{S}(\text{O})_2\text{N}(\text{R}^{5e})-$, $-\text{OC}(\text{O})\text{N}(\text{R}^{5e})-$, $-\text{N}(\text{R}^{5e})\text{C}(\text{O})-$, $-\text{N}(\text{R}^{5e})\text{SO}_2-$, $-\text{N}(\text{R}^{5e})$ 65

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$\text{C}(\text{O})\text{O}-$, $-\text{N}(\text{R}^{5e})\text{C}(\text{O})\text{N}(\text{R}^{5e})-$, $-\text{N}(\text{R}^{5e})\text{SO}_2\text{N}(\text{R}^{5e})-$, $-\text{OC}(\text{O})-$, or $-\text{C}(\text{O})\text{N}(\text{R}^{5e})\text{O}-$;

L_3 is an optionally substituted C^{1-3} alkylene chain, where one carbon atom may be replaced with $-\text{CR}^d=\text{CR}^d-$; each occurrence of R^d is independently hydrogen, fluoro, or unsubstituted or substituted C_{1-4} aliphatic; each occurrence of R^{4a} is independently hydrogen, or unsubstituted or substituted C_{1-4} aliphatic; ring B is optionally further substituted with m occurrences of R^1 ; each occurrence of R^1 is independently chloro, fluoro, $-\text{O}-\text{C}_{1-4}$ alkyl, cyano, hydroxy, C_{1-4} alkyl, or C_{1-4} fluoroalkyl; ring A is optionally further substituted with n occurrences of R^2 ; each occurrence of R^2 is independently fluoro, C_{1-4} alkyl, or C_{1-4} fluoroalkyl; m is 0-2; and n is 0-4.

3. The compound of claim 1, wherein: G is $-\text{R}^3$, $-\text{V}_1-\text{R}^3$, or $-\text{L}_1-\text{R}^3$; and V_1 is $-\text{S}(\text{O})_2-$; R^1 is chloro, fluoro, cyano, hydroxy, methoxy, ethoxy, trifluoromethoxy, trifluoromethyl, methyl, or ethyl; each occurrence of R^2 is independently fluoro, methyl, or trifluoromethyl; m is 0-1; and n is 0-2.

4. The compound of claim 1, wherein: G is $-\text{[C}(\text{R}^6)(\text{R}^6)]_y-\text{R}^3$, $-\text{[C}(\text{R}^6)(\text{R}^6)]_y-\text{V}_{2a}-\text{R}^3$, $-\text{S}(\text{O})_2-\text{[C}(\text{R}^6)(\text{R}^6)]_y-\text{V}_{2a}-\text{R}^3$, $-\text{S}(\text{O})_2-\text{C}(\text{R}^6)(\text{R}^6)-\text{V}_{2a}-\text{R}^3$, or $-\text{S}(\text{O})_2-\text{[C}(\text{R}^6)(\text{R}^6)]_z-\text{R}^3$; R^6 is hydrogen, C_{1-4} aliphatic, C_{3-6} cycloaliphatic, or 6-10-membered aryl; R^6 is hydrogen, C_{1-4} aliphatic, C_{3-6} cycloaliphatic, or 6-10-membered aryl; or R^6 and R^6 are taken together to form a C_{3-6} cycloaliphatic group; V_{2a} is $-\text{O}-$ or $-\text{NH}-$; R^1 is chloro, fluoro, cyano, hydroxy, methoxy, ethoxy, trifluoromethoxy, trifluoromethyl, methyl, or ethyl; each occurrence of R^2 is independently fluoro, methyl, or trifluoromethyl; m is 0-1; n is 0-2; y is 2-3; and z is 0-3.

5. The compound of claim 4, wherein: G is $-\text{[C}(\text{R}^6)(\text{R}^6)]_z-\text{R}^3$ or $-\text{S}(\text{O})_2-\text{[C}(\text{R}^6)(\text{R}^6)]_z-\text{R}^3$; m is 0; n is 0; z is 0-1; R^3 is $-\text{R}^{3a}$; R^a is unsubstituted or substituted 6-10-membered aryl, or unsubstituted or substituted 5-10-membered heteroaryl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur; wherein R^{3a} if substituted is substituted with 0-1 occurrences of $-\text{R}^5$, and one occurrence of $-\text{R}^{5d}$; each occurrence of R^{5a} is independently chloro, fluoro, C_{1-4} alkyl, C_{1-6} fluoroalkyl, $-\text{O}-\text{C}_{1-6}$ alkyl, $-\text{O}-\text{C}_{1-6}$ fluoroalkyl, cyano, hydroxy, $-\text{NHC}(\text{O})\text{C}_{1-6}$ alkyl, $-\text{NHC}_{1-6}$ alkyl, $-\text{N}(\text{C}_{1-6}\text{alkyl})_2$, $-\text{C}(\text{O})\text{NHC}_{1-6}$ alkyl, $-\text{C}(\text{O})\text{N}(\text{C}_{1-6}\text{alkyl})_2$, $-\text{NHC}(\text{O})\text{NHC}_{1-6}$ alkyl, $-\text{NHC}(\text{O})\text{N}(\text{C}_{1-6}\text{alkyl})_2$, or $-\text{NHS}(\text{O})_2\text{C}_{1-6}$ alkyl;

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R^{5d} is unsubstituted or substituted with 1-2 occurrences of $-R^{7a}$; and

each occurrence of R^{7a} is independently chloro, fluoro, bromo, iodo, C_{1-6} alkyl, C_{1-6} fluoroalkyl, $-O-C_{1-6}$ alkyl, $-O-C_{1-6}$ fluoroalkyl, cyano, hydroxy, $-NHC(O)C_{1-6}$ alkyl, $-NHC_{1-6}$ alkyl, $-N(C_{1-6} \text{ alkyl})_2$, $-C(O)NHC_{1-6}$ alkyl, $-C(O)N(C_{1-6} \text{ alkyl})_2$, $-NHC(O)NHC_{1-6}$ alkyl, $-NHC(O)N(C_{1-6} \text{ alkyl})_2$, or $-NHS(O)_2C_{1-6}$ alkyl.

6. The compound of claim 5, wherein p is 1 and q is 1.

7. The compound of claim 4, wherein:

m is 0;

n is 0;

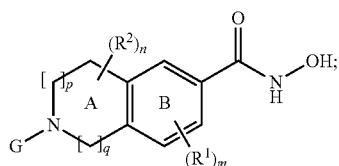
R^3 is $-R^{3d}$;

R^{3d} is unsubstituted or substituted C_{1-6} aliphatic, unsubstituted or substituted 3-10-membered cycloaliphatic, unsubstituted or substituted 4-10-membered saturated or partially unsaturated heterocyclyl having 1-4 heteroatoms independently selected from nitrogen, oxygen, and sulfur, unsubstituted or substituted 6-10-membered aryl, or unsubstituted or substituted 5-10-membered heteroaryl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur; wherein R^{3d} if substituted is substituted with 0-2 independent occurrences of $-R^{5a}$; and

each occurrence of R^{5a} is independently chloro, fluoro, C_{1-4} alkyl, C_{1-6} fluoroalkyl, $-O-C_{1-6}$ alkyl, $-O-C_{1-6}$ fluoroalkyl, cyano, hydroxy, $-NHC(O)C_{1-6}$ alkyl, $-NHC_{1-6}$ alkyl, $-N(C_{1-6} \text{ alkyl})_2$, $-C(O)NHC_{1-6}$ alkyl, $-C(O)N(C_{1-6} \text{ alkyl})_2$, $-NHC(O)NHC_{1-6}$ alkyl, $-NHC(O)N(C_{1-6} \text{ alkyl})_2$, or $-NHS(O)_2C_{1-6}$ alkyl.

8. The compound of claim 7, wherein p is 1 and q is 1.

9. A compound of formula (I):



or a pharmaceutically acceptable salt thereof; wherein:

p is 0 and q is 1; or p is 1 and q is 1;

G is $-C(O)-(CH_2)_p-R^{3e}$, $-C(O)-N(R^{4a})-(CH_2)_q-R^{3e}$, $-C(O)-O-(CH_2)_q-R^{3e}$, $-C(O)-CH_2-V_{2a}-R^{3e}$, $-C(O)-(CH_2)_q-V_{2a}-R^{3e}$, $-C(O)-N(R^{4a})-(CH_2)_q-V_{2a}-R^{3e}$, or $-C(O)-O-(CH_2)_q-V_{2a}-R^{3e}$;

R^{3e} is unsubstituted or substituted 7-10-membered cycloaliphatic, unsubstituted or substituted 7-10 membered saturated or partially unsaturated heterocyclyl having 1-4 heteroatoms independently selected from nitrogen, oxygen, and sulfur, or unsubstituted or substituted 5-10-membered heteroaryl having 3-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur;

V_{2a} is $-C(O)-$, $-O-$, $-S-$, $-N(R^{4a})-$, or $-C(O)N(R^{4a})-$;

$V_{2a'}$ is $-O-$, $-S-$, or $-N(R^{4a})-$;

each occurrence of R^{4a} is independently hydrogen, or unsubstituted or substituted C_{1-4} aliphatic;

ring B is optionally further substituted with m occurrences of R^1 ;

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each occurrence of R^1 is independently chloro, fluoro, $-O-C_{1-4}$ alkyl, cyano, hydroxy, C_{1-4} alkyl, or C_{1-4} fluoroalkyl;

ring A is optionally further substituted with n occurrences of R^2 ;

each occurrence of R^2 is independently fluoro, C_{1-4} alkyl, or C_{1-4} fluoroalkyl;

zz is 0-3;

yy is 2-3;

m is 0-2; and

n is 0-4.

10. The compound of claim 9, wherein:

each occurrence of R^1 is independently chloro, fluoro, methoxy, ethoxy, propoxy, cyano, trifluoromethyl, methyl, ethyl, n-propyl, isopropyl, or tert-butyl;

each occurrence of R^2 is independently fluoro, methyl, or trifluoromethyl;

m is 0-1; and

n is 0-2.

11. The compound of claim 9, wherein:

R^{3e} if substituted is substituted with 0-1 occurrences of $-R^{5e}$, and 0-1 occurrences of $-R^{5d}$;

each occurrence of R^{5a} is independently chloro, fluoro, C_{1-4} alkyl, C_{1-6} fluoroalkyl, $-O-C_{1-6}$ alkyl, $-O-C_{1-6}$ fluoroalkyl, cyano, hydroxy, $-NHC(O)C_{1-6}$ alkyl, $-NHC_{1-6}$ alkyl, $-N(C_{1-6} \text{ alkyl})_2$, $-C(O)NHC_{1-6}$ alkyl, $-C(O)N(C_{1-6} \text{ alkyl})_2$, $-NHC(O)NHC_{1-6}$ alkyl, $-NHC(O)N(C_{1-6} \text{ alkyl})_2$, or $-NHS(O)_2C_{1-6}$ alkyl;

each occurrence of R^{5d} is an optionally substituted group selected from 6-10-membered aryl, or 5-10-membered heteroaryl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur; wherein R^{5d} if substituted is substituted with 1-2 occurrences of $-R^{7a}$; and

each occurrence of R^{7a} is independently chloro, fluoro, bromo, iodo, C_{1-6} alkyl, C_{1-6} fluoroalkyl, $-O-C_{1-6}$ alkyl, $-O-C_{1-6}$ fluoroalkyl, cyano, hydroxy, $-NHC(O)C_{1-6}$ alkyl, $-NHC_{1-6}$ alkyl, $-N(C_{1-6} \text{ alkyl})_2$, $-C(O)NHC_{1-6}$ alkyl, $-C(O)N(C_{1-6} \text{ alkyl})_2$, $-NHC(O)NHC_{1-6}$ alkyl, $-NHC(O)N(C_{1-6} \text{ alkyl})_2$, or $-NHS(O)_2C_{1-6}$ alkyl.

12. The compound of claim 11, wherein:

G is $-C(O)-R^{3e}$, $-C(O)-N(R^{4e})-R^{3e}$, $-C(O)-O-R^{3e}$, $-C(O)-CH_2-R^{3e}$, $-C(O)-N(R^{4e})-CH_2-R^{3e}$, or $-C(O)-O-CH_2-R^{3e}$; and

R^{3e} is triazolyl, thiadiazolyl, oxadiazolyl, benzthiadiazolyl, 2, 3-4H-furo[3,2-b]pyrrolyl, pyrazolopyrimidinyl, purinyl, pteridinyl, quinuclidinyl, diazepinyl, decahydroquinolinyl, oxazepinyl, thiazepinyl, oxazepinyl, thiazepinyl, cycloheptyl, cyclooctyl, cycloheptenyl, cyclooctenyl, bicycloheptanyl, bicyclooctanyl, quinuclidinyl, or adamantyl.

13. The compound of claim 11, wherein:

each occurrence of R^1 is independently chloro, fluoro, methoxy, ethoxy, propoxy, cyano, trifluoromethyl, methyl, ethyl, n-propyl, isopropyl, or tert-butyl;

each occurrence of R^2 is independently fluoro, methyl, or trifluoromethyl;

m is 0-1;

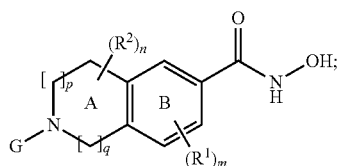
n is 0-2;

p is 1; and

q is 1.

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14. A compound of formula (I):



or a pharmaceutically acceptable salt thereof;
wherein:

p is 0 and q is 1; or p is 1 and q is 1;

G is $-\text{C}(\text{O})-(\text{CH}_2)_{zz}-\text{R}^{3f}$, $-\text{C}(\text{O})-\text{N}(\text{R}^{4a})-(\text{CH}_2)_{zz}-\text{R}^{3f}$, $-\text{C}(\text{O})-\text{O}-(\text{CH}_2)_{zz}-\text{R}^{3f}$, $-\text{C}(\text{O})-\text{CH}_2-\text{V}_{2a}-\text{R}^{3f}$, $-\text{C}(\text{O})-(\text{CH}_2)_{yy}-\text{V}_{2a}-\text{R}^{3f}$, $-\text{C}(\text{O})-\text{N}(\text{R}^{4a})-(\text{CH}_2)_{yy}-\text{V}_{2a}-\text{R}^{3f}$, or $-\text{C}(\text{O})-\text{O}-(\text{CH}_2)_{yy}-\text{V}_{2a}-\text{R}^{3f}$;

R^{3f} is substituted C_{1-6} aliphatic, substituted 3-6-membered cycloaliphatic, substituted 4-6-membered saturated or partially unsaturated heterocyclyl having 1-2 heteroatoms independently selected from nitrogen, oxygen, and sulfur, substituted 6-10-membered aryl, or substituted 5-10-membered heteroaryl having 1-2 heteroatoms independently selected from nitrogen, oxygen, and sulfur; wherein R^{3f} is substituted with 1-2 independent occurrences of R^{5aa} ;

each occurrence of R^{5aa} is independently cyano, hydroxy, C_{1-6} aliphatic substituted with 1-2 occurrences of R^7 or R^8 , C_{1-6} fluoroalkyl, $-\text{O}-\text{C}_{1-6}$ fluoroalkyl, $-\text{NHC}(\text{O})\text{C}_{1-6}$ alkyl, $-\text{NHC}(\text{O})\text{C}_{3-6}$ cycloalkyl, $-\text{C}(\text{O})\text{NHC}_{1-6}$ alkyl, $-\text{NHC}(\text{O})\text{NHC}_{1-6}$ alkyl, $-\text{NHS}(\text{O})_2\text{C}_{1-6}$ alkyl, $-\text{NHC}_{1-6}$ alkyl, $-\text{N}(\text{C}_{1-6}\text{ alkyl})_2$, or phenyl substituted with 1-2 occurrence of $-\text{R}^{7a}$;

each occurrence of R^7 is independently unsubstituted or substituted 4-10-membered saturated or partially unsaturated heterocyclyl having 1-4 heteroatoms independently selected from nitrogen, oxygen, and sulfur, unsubstituted or substituted 6-10-membered aryl, or unsubstituted or substituted 5-10-membered heteroaryl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur;

each occurrence of R^8 is independently chloro, fluoro, $-\text{OH}$, $-\text{O}(\text{C}_{1-6}\text{ alkyl})$, $-\text{CN}$, $-\text{N}(\text{C}_{1-6}\text{ alkyl})_2$, $-\text{NH}(\text{C}_{1-6}\text{ alkyl})$, $-\text{C}(\text{O})(\text{C}_{1-6}\text{ alkyl})$, $-\text{CO}_2\text{H}$, $-\text{CO}_2(\text{C}_{1-6}\text{ alkyl})$, $-\text{C}(\text{O})\text{NH}_2$, or $-\text{C}(\text{O})\text{NH}(\text{C}_{1-6}\text{ alkyl})$;

each occurrence of R^{7a} is independently chloro, fluoro, bromo, iodo, C_{1-6} alkyl, C_{1-6} fluoroalkyl, $-\text{O}-\text{C}_{1-6}$ alkyl, $-\text{O}-\text{C}_{1-6}$ fluoroalkyl, cyano, hydroxy, $-\text{NHC}(\text{O})\text{C}_{1-6}$ alkyl, $-\text{NHC}_{1-6}$ alkyl, $-\text{N}(\text{C}_{1-6}\text{ alkyl})_2$, $-\text{C}(\text{O})\text{NHC}_{1-6}$ alkyl, $-\text{C}(\text{O})\text{N}(\text{C}_{1-6}\text{ alkyl})_2$, $-\text{NHC}(\text{O})\text{NHC}_{1-6}$ alkyl, $-\text{NHC}(\text{O})\text{N}(\text{C}_{1-6}\text{ alkyl})_2$, or $-\text{NHS}(\text{O})_2\text{C}_{1-6}$ alkyl;

V_{2a} is $-\text{C}(\text{O})-$, $-\text{O}-$, $-\text{S}-$, $-\text{N}(\text{R}^{4a})-$, or $-\text{C}(\text{O})\text{N}(\text{R}^{4a})-$;

$\text{V}_{2a'}$ is $-\text{O}-$, $-\text{S}-$, or $-\text{N}(\text{R}^{4a})-$;

each occurrence of R^{4a} is independently hydrogen, or unsubstituted or substituted C_{1-4} aliphatic;

ring B is optionally further substituted with m occurrences of R^1 ;

each occurrence of R^1 is independently chloro, fluoro, $-\text{O}-\text{C}_{1-4}$ alkyl, cyano, hydroxy, C_{1-4} alkyl, or C_{1-4} fluoroalkyl;

ring A is optionally further substituted with n occurrences of R^2 ;

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each occurrence of R^2 is independently fluoro, C_{1-4} alkyl, or C_{1-4} fluoroalkyl;

zz is 0-3;

yy is 2-3;

m is 0-2; and

n is 0-4.

15. The compound of claim 14, wherein:

each occurrence of R^1 is independently chloro, fluoro, methoxy, ethoxy, propoxy, cyano, trifluoromethyl, methyl, ethyl, n-propyl, isopropyl, or tert-butyl;

each occurrence of R^2 is independently fluoro, methyl, or trifluoromethyl;

m is 0-1; and

n is 0-2.

16. The compound of claim 14, wherein:

G is $-\text{C}(\text{O})-\text{R}^{3f}$, $-\text{C}(\text{O})-\text{N}(\text{R}^{4a})-\text{R}^{3f}$, $-\text{C}(\text{O})-\text{O}-\text{R}^{3f}$, $-\text{C}(\text{O})-\text{CH}_2-\text{R}^{3f}$, $-\text{C}(\text{O})-\text{N}(\text{R}^{4a})-\text{CH}_2-\text{R}^{3f}$, or $-\text{C}(\text{O})-\text{O}-\text{CH}_2-\text{R}^{3f}$.

17. The compound of claim 14, wherein:

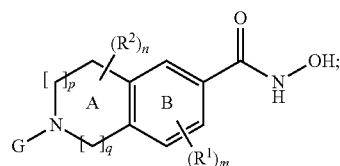
each occurrence of R^{5aa} is independently cyano, hydroxy, trifluoromethyl, trifluoromethoxy, $-\text{NHC}(\text{O})\text{CH}_3$, $-\text{NHC}(\text{O})$ -cyclopropyl, $-\text{C}(\text{O})\text{NHCH}_3$, $-\text{NHC}(\text{O})\text{NHCH}_3$, $-\text{NHS}(\text{O})_2\text{CH}_3$, $-\text{NHCH}_3$, $-\text{N}(\text{CH}_3)_2$, 4-methoxyphenyl, 3-chlorophenyl, 4-chlorophenyl, or 3-methoxyphenyl.

18. The compound of claim 14, wherein:

p is 1; and

q is 1.

19. A compound of formula (I):



or a pharmaceutically acceptable salt thereof;
wherein:

p is 0 and q is 1; or p is 1 and q is 1;

G is $-\text{C}(\text{O})-(\text{CH}_2)_{zz}-\text{R}^{3h}$, $-\text{C}(\text{O})-\text{N}(\text{R}^{4a})-(\text{CH}_2)_{zz}-\text{R}^{3h}$, $-\text{C}(\text{O})-\text{O}-(\text{CH}_2)_{zz}-\text{R}^{3h}$, $-\text{C}(\text{O})-\text{CH}_2-\text{V}_{2a}-\text{R}^{3h}$, $-\text{C}(\text{O})-(\text{CH}_2)_{yy}-\text{V}_{2a}-\text{R}^{3h}$, $-\text{C}(\text{O})-\text{N}(\text{R}^{4a})-(\text{CH}_2)_{yy}-\text{V}_{2a}-\text{R}^{3h}$, or $-\text{C}(\text{O})-\text{O}-(\text{CH}_2)_{yy}-\text{V}_{2a}-\text{R}^{3h}$;

R^{3h} is unsubstituted or substituted C_{1-6} aliphatic, unsubstituted or substituted 3-6-membered cycloaliphatic, unsubstituted or substituted 4-6-membered saturated or partially unsaturated heterocyclyl having 1-2 heteroatoms independently selected from nitrogen, oxygen, and sulfur, unsubstituted or substituted 6-10-membered aryl, or substituted 5-10-membered heteroaryl having 1-2 heteroatoms independently selected from nitrogen, oxygen, and sulfur; wherein R^{3h} if substituted is substituted with 0-2 occurrences of R^{5aaa} ;

each occurrence of R^{5aaa} is independently chloro, fluoro, C_{1-4} alkyl, $-\text{O}-\text{C}_{1-6}$ alkyl, or phenyl;

V_{2a} is $-\text{C}(\text{O})-$, $-\text{O}-$, $-\text{S}-$, $-\text{N}(\text{R}^{4a})-$, or $-\text{C}(\text{O})\text{N}(\text{R}^{4a})-$;

$\text{V}_{2a'}$ is $-\text{O}-$, $-\text{S}-$, or $-\text{N}(\text{R}^{4a})-$;

each occurrence of R^{4a} is independently hydrogen, or unsubstituted or substituted C_{1-4} aliphatic;

ring B is optionally further substituted with m occurrences of R^1 ;

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each occurrence of R¹ is independently chloro, fluoro, —O—C₁₋₄ alkyl, cyano, hydroxy, C₁₋₄ alkyl, or C₁₋₄ fluoroalkyl;
 ring A is optionally further substituted with n occurrences of R²;
 each occurrence of R² is independently fluoro, C₁₋₄ alkyl, or C₁₋₄ fluoroalkyl;
 zz is 0-3;
 yy is 2-3;
 m is 0-2;
 n is 0-4; and
 the total of m and n must be at least 1.

20. The compound of claim 19, wherein:
 each occurrence of R¹ is independently chloro, fluoro, methoxy, ethoxy, propoxy, cyano, trifluoromethyl, methyl, ethyl, n-propyl, isopropyl, or tert-butyl;

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each occurrence of R² is independently fluoro, methyl, or trifluoromethyl; and

m is 1 and n is 0; or m is 0 and n is 1; or m is 0 and n is 2; or m is 1 and n is 2.

21. The compound of claim 19, wherein:

G is —C(O)—R^{3h}, —C(O)—N(R^{4a})—R^{3h}, —C(O)—O—R^{3h}, —C(O)—CH₂—R^{3h}, —C(O)—N(R^{4a})—CH₂—R^{3h}, or —C(O)—O—CH₂—R^{3h}.

22. The compound of claim 19, wherein:

p is 1; and

q is 1.

23. The compound of claim 1, wherein the compound is:

-
- 38 2-(butylsulfonyl)-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 39 2-(benzylsulfonyl)-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 40 N-hydroxy-2-(propylsulfonyl)-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 41 N-hydroxy-2-[(2-oxo-2,3-dihydro-1,3-benzoxazol-6-yl)sulfonyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 42 N-hydroxy-2-[(4-isopropylphenyl)sulfonyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 43 N-hydroxy-2-[(4'-methoxybiphenyl-4-yl)sulfonyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 44 2-[(4-tert-butylphenyl)sulfonyl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 45 N-hydroxy-2-[(4-methylphenyl)sulfonyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 46 N-hydroxy-2-(phenylsulfonyl)-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 47 N-hydroxy-2-(2-naphthylsulfonyl)-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 48 2-[(4'-fluorobiphenyl-3-yl)sulfonyl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 49 N-hydroxy-2-[(4-methoxyphenyl)sulfonyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 50 2-[(4-fluorophenyl)sulfonyl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 51 2-[(1,2-dimethyl-1H-imidazol-4-yl)sulfonyl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 52 N-hydroxy-2-[(4-(trifluoromethyl)phenyl)sulfonyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 53 2-[(3,5-dimethylisoxazol-4-yl)sulfonyl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 54 2-[(3,5-dimethyl-1H-pyrazol-4-yl)sulfonyl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 55 N-hydroxy-2-[(4-(pyridin-4-yloxy)phenyl)sulfonyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 56 2-[(2,2-diphenylethyl)sulfonyl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 57 2-benzyl-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 58 N-hydroxy-2-[2-(1-naphthyl)ethyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 59 N-hydroxy-2-[4-(1H-1,2,4-triazol-1-yl)benzyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 60 N-hydroxy-2-(quinolin-2-ylmethyl)-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 61 N-hydroxy-2-[4-(trifluoromethoxy)benzyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 62 N-hydroxy-2-(3-phenylpropyl)-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 63 N-hydroxy-2-(2-phenoxyethyl)-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 64 N-hydroxy-2-[(2E)-3-phenylprop-2-en-1-yl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 65 2-(2,1,3-benzoxadiazol-5-ylmethyl)-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 66 N-hydroxy-2-[4-(trifluoromethyl)benzyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 67 N-hydroxy-2-(3-phenoxypropyl)-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 68 N-hydroxy-2-[4-(1H-pyrazol-1-yl)benzyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 69 2-(2,1,3-benzothiadiazol-4-ylmethyl)-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 71 2-[[3-(4-chlorophenyl)-1,2,4-oxadiazol-5-yl]methyl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 72 N-hydroxy-2-[[5-(2-methoxyphenyl)-1,2,4-oxadiazol-3-yl]methyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 73 2-[3-(2,3-dihydro-1H-indol-1-yl)-3-oxopropyl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 74 2-[(1-benzyl-1H-imidazol-2-yl)methyl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 75 2-[4-(2,3-dihydro-1,4-benzodioxin-6-yl)-1,3-thiazol-2-yl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 76 N-hydroxy-2-[4-(3-methyl-1-benzothien-2-yl)-1,3-thiazol-2-yl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
 77 2-[4-(3-chlorophenyl)-1,3-thiazol-2-yl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide
-

or a pharmaceutically acceptable salt thereof.

24. The compound of claim 1, wherein the compound is:

-
- 108 N-hydroxy-2-[[2-(2-thienyl)-1,3-thiazol-4-yl]methyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide;
 109 N-hydroxy-2-[3-(trifluoromethoxy)benzyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide;
 110 N-hydroxy-2-(1-phenylethyl)-1,2,3,4-tetrahydroisoquinoline-6-carboxamide;
 111 2-[2-(4-chlorophenoxy)ethyl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide;
 112 N-hydroxy-2-[(5-isoxazol-3-yl-3-thienyl)sulfonyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide;
 116 2-[2-[(2,6-dimethylphenyl)amino]-2-oxoethyl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide;
 153 2-[(4-tert-butylphenyl)sulfonyl]-8-fluoro-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide;

-continued

-
- 154 8-fluoro-N-hydroxy-2-[(4'-methoxybiphenyl-4-yl)sulfonyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide;
- 155 2-[(4'-fluorobiphenyl-3-yl)sulfonyl]-N-hydroxy-4,4-dimethyl-1,2,3,4-tetrahydroisoquinoline-6-carboxamide;
- 156 N-hydroxy-4,4-dimethyl-2-(propylsulfonyl)-1,2,3,4-tetrahydroisoquinoline-6-carboxamide;
- 159 2-[(4-tert-butylphenyl)sulfonyl]-N-hydroxy-8-methoxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide;
- 160 N-hydroxy-8-methoxy-2-[(4'-methoxybiphenyl-4-yl)sulfonyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide;
- 161 2-[(4-tert-butylphenyl)sulfonyl]-N-hydroxy-8-methyl-1,2,3,4-tetrahydroisoquinoline-6-carboxamide;
- 162 N-hydroxy-2-[(4'-methoxybiphenyl-4-yl)sulfonyl]-8-methyl-1,2,3,4-tetrahydroisoquinoline-6-carboxamide;
- 164 2-[(4-tert-butylphenyl)sulfonyl]-8-chloro-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide;
- 165 8-chloro-2-[(4'-fluorobiphenyl-3-yl)sulfonyl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide;
- 166 8-cyano-2-[(4'-fluorobiphenyl-3-yl)sulfonyl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide;
- 167 8-cyano-N-hydroxy-2-(propylsulfonyl)-1,2,3,4-tetrahydroisoquinoline-6-carboxamide;
- 168 5-fluoro-2-[(4'-fluorobiphenyl-3-yl)sulfonyl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide;
- 169 5-fluoro-N-hydroxy-2-(propylsulfonyl)-1,2,3,4-tetrahydroisoquinoline-6-carboxamide;
- 170 2-[(4-tert-butylphenyl)sulfonyl]-N-hydroxyisoindoline-5-carboxamide;
- 171 N-hydroxy-2-(propylsulfonyl)isoindoline-5-carboxamide;
- 172 N-hydroxy-7-methoxy-2-[(4'-methoxybiphenyl-4-yl)sulfonyl]isoindoline-5-carboxamide;
- 173 N-hydroxy-7-methoxy-2-(propylsulfonyl)isoindoline-5-carboxamide;
- 174 7-chloro-N-hydroxy-2-[(4'-methoxybiphenyl-4-yl)sulfonyl]isoindoline-5-carboxamide;
- 175 7-chloro-2-[(4'-fluorobiphenyl-3-yl)sulfonyl]-N-hydroxyisoindoline-5-carboxamide;
- 186 N-hydroxy-4,4-dimethyl-2-[[4-(trifluoromethyl)phenyl]sulfonyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide;
- 188 8-chloro-N-hydroxy-2-[[4-(trifluoromethyl)phenyl]sulfonyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide;
- 200 2-[4-(3-chlorophenyl)-1,3-thiazol-2-yl]-N-hydroxy-4,4-dimethyl-1,2,3,4-tetrahydroisoquinoline-6-carboxamide;
- 201 N-hydroxy-4,4-dimethyl-2-[4-(3-methyl-1-benzothien-2-yl)-1,3-thiazol-2-yl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide;
- 204 2-[4-(3-chlorophenyl)-1,3-thiazol-2-yl]-N-hydroxy-8-methoxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide;
- 205 N-hydroxy-8-methoxy-2-[4-[4-(trifluoromethyl)phenyl]-1,3-thiazol-2-yl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide;
- 206 2-[4-(3-chlorophenyl)-1,3-thiazol-2-yl]-N-hydroxy-8-methyl-1,2,3,4-tetrahydroisoquinoline-6-carboxamide;
- 207 N-hydroxy-8-methyl-2-[4-(3-methyl-1-benzothien-2-yl)-1,3-thiazol-2-yl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide;
- 208 8-fluoro-N-hydroxy-2-[4-(4-methoxyphenyl)-1,3-thiazol-2-yl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide;
- 209 2-[4-(benzylamino)pyrimidin-2-yl]-8-fluoro-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide;
- 210 2-[2-(benzylamino)pyrimidin-4-yl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide;
- 211 N-hydroxy-2-(4-pyridin-3-yl-1,3-thiazol-2-yl)-1,2,3,4-tetrahydroisoquinoline-6-carboxamide;
- 212 8-chloro-2-[4-(3-chlorophenyl)-1,3-thiazol-2-yl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide;
- 213 8-chloro-N-hydroxy-2-[4-[4-(trifluoromethyl)phenyl]-1,3-thiazol-2-yl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide;
- 214 8-cyano-N-hydroxy-2-[4-(3-methyl-1-benzothien-2-yl)-1,3-thiazol-2-yl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide;
- 215 8-cyano-N-hydroxy-2-[4-(4-methoxyphenyl)-1,3-thiazol-2-yl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide;
- 216 2-[4-(benzylamino)pyrimidin-2-yl]-5-fluoro-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide;
- 217 2-[2-(benzylamino)pyrimidin-4-yl]-5-fluoro-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide;
- 218 N-hydroxy-2-(4-pyridin-3-yl-1,3-thiazol-2-yl)isoindoline-5-carboxamide;
- 219 N-hydroxy-2-[4-[4-(trifluoromethyl)phenyl]-1,3-thiazol-2-yl]isoindoline-5-carboxamide;
- 220 2-[4-(3-chlorophenyl)-1,3-thiazol-2-yl]-N-hydroxy-7-methoxyisoindoline-5-carboxamide;
- 221 N-hydroxy-7-methoxy-2-[4-(3-methyl-1-benzothien-2-yl)-1,3-thiazol-2-yl]isoindoline-5-carboxamide;
- 222 7-chloro-N-hydroxy-2-[4-(4-methoxyphenyl)-1,3-thiazol-2-yl]isoindoline-5-carboxamide;
- 223 2-[4-(benzylamino)pyrimidin-2-yl]-7-chloro-N-hydroxyisoindoline-5-carboxamide;
-

or a pharmaceutically acceptable salt thereof.

25. The compound of claim 9, wherein the compound is:

-
- 22 2-(cycloheptylcarbonyl)-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide;
- 33 2-[1-adamantylcarbonyl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide;

-continued

89 N²-(2,3-dihydro-1-benzofuran-5-yl)-N⁶-hydroxy-3,4-dihydroisoquinoline-2,6(1H)-dicarboxamide;
 90 N²-1,3-benzodioxol-5-yl-N⁶-hydroxy-3,4-dihydroisoquinoline-2,6(1H)-dicarboxamide;
 144 2-(cycloheptylcarbonyl)-N-hydroxyisoindoline-5-carboxamide;
 145 2-(cycloheptylcarbonyl)-N-hydroxy-7-methoxyisoindoline-5-carboxamide;
 146 7-chloro-2-(cycloheptylcarbonyl)-N-hydroxyisoindoline-5-carboxamide;
 147 2-[1-adamantylcarbonyl]-N-hydroxy-1,1-dimethyl-1,2,3,4-tetrahydroisoquinoline-6-carboxamide;
 148 2-[1-adamantylcarbonyl]-8-chloro-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide;
 248 N-hydroxy-2-[(3-hydroxy-1-adamantyl)carbonyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide ;

or a pharmaceutically acceptable salt thereof.

26. The compound of claim 14, wherein the compound is:

3 N-hydroxy-2-{[4-(trifluoromethyl)phenyl]acetyl}-1,2,3,4-tetrahydroisoquinoline-6-carboxamide;
 4 2-{[1-(4-chlorophenyl)cyclobutyl]carbonyl}-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide;
 10 N-hydroxy-2-[2-(4-methylphenyl)propanoyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide;
 13 N-hydroxy-2-[3-(1H-indol-1-yl)propanoyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide;
 17 2-[(2R)-2-(acetilamino)-4-methylpentanoyl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide;
 34 N-hydroxy-2-[(3-methoxyphenyl)acetyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide;
 35 N-hydroxy-2-[(4-isopropylphenyl)acetyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide;
 80 2-[2-(4-chlorophenyl)-2-methylpropanoyl]-N-hydroxyisoindoline-5-carboxamide;
 91 N⁶-hydroxy-N²-(2-phenylethyl)-3,4-dihydroisoquinoline-2,6(1H)-dicarboxamide ;
 92 N⁶-hydroxy-N²-[4-(trifluoromethoxy)phenyl]-3,4-dihydroisoquinoline-2,6(1H)-dicarboxamide;
 98 N⁶-hydroxy-N²-[3-(trifluoromethyl)phenyl]-3,4-dihydroisoquinoline-2,6(1H)-dicarboxamide;
 99 N²-(4-benzylphenyl)-N⁶-hydroxy-3,4-dihydroisoquinoline-2,6(1H)-dicarboxamide;
 105 N⁶-hydroxy-N²-(4-methylbenzyl)-3,4-dihydroisoquinoline-2,6(1H)-dicarboxamide;
 135 2-[2-(4-chlorophenyl)-2-methylpropanoyl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide;
 136 2-[2-(4-chlorophenyl)-2-methylpropanoyl]-8-fluoro-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide;
 137 8-chloro-2-[2-(4-chlorophenyl)-2-methylpropanoyl]-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide;
 149 N-hydroxy-2-[4-(trifluoromethyl)benzoyl]isoindoline-5-carboxamide;

or a pharmaceutically acceptable salt thereof.

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27. The compound of claim 19, wherein the compound is:

118 8-fluoro-N-hydroxy-2-[(3-methoxy-1-methyl-1H-pyrrol-2-yl)carbonyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide;
 119 8-chloro-N-hydroxy-2-[(3-methoxy-1-methyl-1H-pyrrol-2-yl)carbonyl]-1,2,3,4-tetrahydroisoquinoline-6-carboxamide;
 126 N-hydroxy-7-methoxy-2-[(5-methoxy-1-methyl-1H-indol-2-yl)carbonyl]isoindoline-5-carboxamide;
 127 7-chloro-N-hydroxy-2-[(5-methoxy-1-methyl-1H-indol-2-yl)carbonyl]isoindoline-5-carboxamide;
 138 2-(4-tert-butylbenzoyl)-N-hydroxy-4,4-dimethyl-1,2,3,4-tetrahydroisoquinoline-6-carboxamide;
 140 2-(4-tert-butylbenzoyl)-N-hydroxy-8-methoxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide;
 141 2-(biphenyl-4-ylacetyl)-N-hydroxy-8-methoxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide;
 142 2-(biphenyl-4-ylacetyl)-N-hydroxy-8-methyl-1,2,3,4-tetrahydroisoquinoline-6-carboxamide;
 143 2-(biphenyl-4-ylacetyl)-8-cyano-N-hydroxy-1,2,3,4-tetrahydroisoquinoline-6-carboxamide;

or a pharmaceutically acceptable salt thereof.

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28. A composition comprising a compound of any one of claim 1, 2, 9, 14, or 19 and a pharmaceutically acceptable carrier.

* * * * *